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PHYCOLOGIA BRITANNICA:

OR,

A HISTORY OF BRITISH SEA-WEEDS,

CONTAINING

COLOURED FIGURES, GENERIC AND SPECIFIC CHARACTERS,
SYNONYMES, AND DESCRIPTIONS

OF

ALL THE SPECIES OF ALGÆ INHABITING THE SHORES OF THE

BRITISH ISLANDS.

BY

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IN FOUR VOLUMES.

VOL. II.

RHODOSPERMEÆ, OR RED SEA-WEEDS:

PART I.

(*Rhodomelaceæ, Laurenciaceæ, Corallinaceæ, Delesseriaceæ, and Rhodymeniaceæ.*)

SYNOPSIS, No. 98 to 189.

LONDON:
REEVE AND BENHAM,
HENRIETTA STREET, COVENT GARDEN.

1846–51.

6 G

BIBLIOTHECA
REGIA
MONACENSIS.

Reeve imp

PLATE XXXIV.

ODONTHALIA DENTATA, *Lyngb.*

GEN. CHAR. *Frond* plano-convex, two-edged, vinous-red, distichous, obsoletely ribbed, alternately toothed at the margin, cellular; central and surface-cellules minute, irregular. *Fructification* two-fold, on distinct plants; 1, *capsules* (*ceramidia*) furnished with a terminal pore and containing a mass of pear-shaped spores; 2, lanceolate *pods* (*stichidia*) containing tripartite tetraspores in a double row. ODONTHALIA (*Lyngb.*)—from ὀδοὺς, a *tooth*, and φάλος, a *germ* or *branch*.

ODONTHALIA *dentata*; frond irregularly pinnate; branches linear-oblong, deeply pinnatifid; laciniæ alternate, sharply toothed towards their truncate extremities; capsules and pods clustered, axillary or marginal.

ODONTHALIA dentata, *Lyngb. Hyd. Dan.* p. 9. t. 3. *Grev. Fl. Edin.* p. 296. *Grev. Alg. Brit.* p. 101. t. 13. *Hook. Br. Fl.* vol. ii. p. 293. *Harv. Man.* p. 66. *Kütz. Phyc. Gen.* p. 448. *Endl. 3rd Suppl.* p. 47.

RHODOMELA dentata, *Ag. Sp. Alg.* vol. i. p. 370. *Ag. Syst.* p. 196. *Spreng. Syst. Veg.* vol. iv. p. 342.

DELESSERIA dentata, *Lamour. Ess.* p. 36.

FUCUS dentatus, *Lin. Syst. Nat.* vol. ii. p. 718. *Huds. Fl. Ang.* p. 582. *Lightf. Fl. Scot.* vol. ii. p. 952. *With.* vol. iv. p. 102. *Linn. Trans.* vol. iii. p. 158. *Turn. Syn.* vol. i. p. 149. *Stack. Ner. Brit.* p. 95. t. 15. *E. Bot.* t. 1241. *Turn. Hist.* t. 13.

FUCUS atomarius, *Gmelin. Hist. Fuc.* p. 125. t. 10. f. 1.

FUCUS pinnatifidus, *Fl. Dan.* t. 354 (*excl. Syn. Huds.*).

HAB. On rocks in the sea. Perennial. Fruiting in winter. Abundant on the shores of Scotland, and of the north of Ireland. Coast of Durham and Northumberland, rare, *Mr. Winch*.

GEOGR DIST. Coast of northen Europe. Iceland. North America, *Gmelin*.

DESCR. *Fronds* rising from a hard disk, tufted, 3–12 inches long, much branched, furnished with an imperfect mid-rib below, which gradually becomes fainter upwards, flat and membranaceous above; the main stem simple, or forked 2–4 lines wide, alternately toothed. *Branches* issuing from the axils of the teeth of the main stem, tapering at the base, simple or subdivided, deeply pinnatifid; the *laciniæ* erecto-patent, linear, entire for more than half their length, alternately toothed above, the larger ones pinnatifid, with toothed segments; teeth very acute, erect. *Fructification* born along the margin, or confined to the axils of the teeth, on slender, pellucid stalks, which are either simple or branched, solitary or tufted. *Capsules* somewhat pitcher-shaped, with very wide mouths, containing a cluster of dark red, pear-shaped spores; *stichidia* lanceolate, nearly colourless, containing a double row of dark purple tetraspores. Substance cartilagineo-membranaceous subcoriaceous scarcely adhering to paper. *Colour* a deep vinous-red, becoming darker in drying. The *smell* is agreeably pungent, but the taste is insipid.

The genus *Odonthalia*, founded by Lyngbye on our *O. dentata*, and now containing three other species natives of the Kamtschatkan sea, has been singularly misunderstood by Endlicher, who unites with these northern plants of leathery substance and closely cellular structure, several delicate tropical Algæ with highly reticulated fronds, which have scarcely a character common with *Odonthalia* except that minor one which gives the genus its name,—a *toothed* margin.

Odonthalia dentata is peculiarly a northern plant. It abounds throughout the whole of the European, Northern, Atlantic, and North Seas; and probably extends along the coast of Siberia and of North America. In the British Islands, it reaches, perhaps, its southern limit, and is most abundant on the coast of Scotland. In England it does not appear to be found south of Durham, and in Ireland, of Downshire.

It varies very little in the frond, except that some specimens are more luxuriant than others. The mode of branching, and alternate pinnati-section is invariable; but the fructification presents some varieties. In some specimens, such as I have represented, the stichidia are densely clustered, and, as well as the bunches of capsules, confined to the axils of the segments; in others, both kinds of fruit are scattered along the margin. The specimens from which our figure is drawn were kindly communicated in a fresh state by Dr. Dickie, of Aberdeen.

Fig. 1. ODONTHALIA DENTATA:—*natural size*. 2. Laciniæ bearing capsules. 3. Cluster of capsules. 4. Vertical section of a capsule. 5. Laciniæ with pods. 6. Cluster of pods. 7. A pod or stichidium. 8. Tetraspores. 9. transverse section of the lower part of a branch:—*all more or less magnified*.

Plate L.

PLATE L.

RHODOMELA LYCOPODIOIDES, *Ag.*

GEN. CHAR. *Frond* filiform, solid, much branched, inarticulate, reticulated; the axis composed of concentric layers of oblong, hyaline cells; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) containing a tuft of pear-shaped spores; 2, *tetraspores* immersed in swollen ramuli, in a single row. RHODOMELA (*Ag.*)—from ῥοδεος, *red*, and μέλας, *black*; because the species usually become darker in drying.

RHODOMELA *lycopodioides*; frond divided near the base into several long, simple branches, which are densely beset with slender, finely-divided branchlets, mixed with the short, rigid, bristle-like remains of a former series.

RHODOMELA lycopodioides, *Ag. Sp. Alg.* vol. i. p. 377. *Ag. Syst.* p. 199. *Grev. Alg. Brit.* p. 102. *Hook. Br. Fl.* vol. ii. p. 294. *Harv. in Mack. Fl. Hib.* part 3. p. 196. *Harv. Man.* p. 67. *Endl. 3rd Suppl.* p. 47.

GIGARTINA lycopodioides, *Lyngb. Hyd. Dan.* p. 45. *Grev. Fl. Edin.* p. 289.

FURCELLARIA lycopodioides, *Ag. Syn.* p. 11. *Hook. Fl. Scot.* part 2. p. 97.

LOPHURA lycopodioides, *Kütz. Phyc. Gen.* p. 435.

FUCUS lycopodioides, *Linn. Syst. Nat.* p. 717. *Turn. Syn.* vol. ii. p. 343. *E. Bot.* t. 1163. *Turn. Hist.* t. 12.

CONFERVA squarrosa, *Fl. Dan.* t. 357.

HAB. Growing on the stems of *Laminaria digitata*. Perennial. Spring and Summer. Coast of Scotland and of the North of Ireland, frequent. Scarborough, *Sir T. Frankland*. Coast of Northumberland, *Mr. Winch*. Durham, *Mr. J. Thornhill*. Cromer, *Mr. Woodward*. Balbriggan, *Miss Gower*.

GEOGR. DISTR. Northern Europe.

DESCR. *Root* a small disc. *Fronds* from four inches to two feet in length, about half a line in diameter at base, attenuated upwards, cylindrical, filiform, tufted, either simple, or divided at a short distance from the base into several long simple branches, clothed in its winter state with short, rigid, simple, or slightly branched, imbricated ramuli, from half an inch to an inch in length; in summer throwing out from these and from the main stems, numerous, capillary, multifid ramuli, usually from one to two inches in length, but occasionally lengthened into branches from six to fourteen inches in length, and bearing, at short distances, broad tufts of multifid ramuli resembling those usually borne by the main stem. *Capsules* abundant on the summer ramuli, ovate, containing a tuft of pear-shaped seeds. *Tetraspores* tripartite or cruciate, contained in clustered or racemose, stichidiform

ramuli borne by the winter branchlets. *Substance* cartilaginous, in its winter state not adhering to paper; much more tender in summer. *Colour* a purplish brown, becoming very black in drying.

The summer and winter conditions of this species are so unlike each other that I have thought it necessary to represent both, which I could only accomplish within the limits of an octavo plate by figuring very small, but characteristic specimens of each. The summer plant (*fig.* 1) is one of the first year's growth. Those of the second year have the stems clothed with the remains of old ramuli, besides being feathered with young ones. In some magnificent specimens, collected by my friend Mr. Thompson on the Downshire coast, the frond is twenty inches in length, and the lateral branches from six to fourteen inches long; and Dr. Greville informs me that some of his specimens are of equal size. Nothing can well exceed the beauty of such plants, as they wave freely in the water.

Though the common forms of *R. lycopodioides* seem to be very different from *R. subfusca*, specimens are sometimes found which have an intermediate character. The latter is usually a much more branching plant, and is generally found attached to rocks, and its ramuli are much less dense. The microscopic structure in both is very similar.

I must enter a protest against the unnecessary substitution by Kützing of his name *Lophura*, for the old established and universally received *Rhodomela*. Such alterations of established names are most mischievous, leading to no good result, and burdening the science with a number of useless synonymes; and I regret, the more so because his great merits are thereby obscured, that this is not a solitary instance in which this author has needlessly altered the nomenclature.

Fig. 1. RHODOMELA LYCOPODIOIDES, a young summer plant. 2. The same; a winter plant:—*both of the natural size.* 3. A cluster of pods, with tetraspores. 4. A pod separated. 5. Ramulus with capsules. 6. A capsule, separated. 7. Longitudinal section of the stem. 8. Transverse section of one half of the same:—*all more or less magnified.*

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PLATE CCLXIV.

RHODOMELA SUBFUSCA, *Ag.*

GEN. CHAR. *Frond* filiform, solid, much branched, inarticulate, reticulated; the axis composed of concentric layers of oblong, hyaline cells; the periphery of several rows of minute, irregular, coloured cellules. *Fructification*, 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores* immersed in swollen ramuli, or contained in proper pod-like receptacles (*stichidia*) in a single or double row. RHODOMELA (*Ag.*),—from ῥοδεος, *red*, and μελας, *black*; because the species usually become darker in drying.

RHODOMELA *subfusca*; frond filiform, much branched; the branches irregularly divided, clothed with pinnated branchlets, and subulate, simple scattered or fasciculate ramuli; pinnules subulate; tetraspores contained either in the somewhat swollen ultimate ramuli (in summer), or in proper branching stichidia (produced in winter).

RHODOMELA subfusca. *Ag. Sp. Alg.* vol. i. p. 378. *Ag. Syst.* p. 199. *Spreng. Syst. Veg.* vol. iv. p. 343. *Grev. Alg. Brit.* p. 193. *Hook. Br. Fl.* vol. ii. p. 294. *Wyatt, Alg. Damn.* no. 111. *Harv. in Mack. Fl. Hib.* part 3. p. 197. *Harv. Man.* ed. 2. p. 79. *Endl. 3rd Suppl.* p. 47.

LOPHURA cymosa, *Kütz. Phyc. Gen.* p. 435.

GIGARTINA subfusca, *Lamour. Ess.* p. 48. *Lyngb. Hyd. Dan.* p. 47. t. 10. *Grev. Fl. Edin.* p. 289.

SPHÆROCOCCUS subfuscus, *Hook. Fl. Scot.* part 2. p. 104.

FUCUS subfuscus, *Woodw. in Linn. Trans.* vol. i. p. 131. t. 12. *Good. and Woodw. Linn. Trans.* vol. iii. p. 212. *Turn. Syn. Fuc.* p. 350. *Turn. Hist.* t. 10. *E. Bot.* t. 1164. *Esper, Ic. Fuc.* vol. ii. p. 11. t. 117.

FUCUS confervoides, *Huds. Fl. Ang.* p. 591.

FUCUS variabilis, *Good. and Woodw. Linn. Trans.* vol. iii. p. 220.

FUCUS setaceus, *Wulf. Crypt. Aquat.* no. 40.

HAB. On rocks and shells, in pools between tide marks; sometimes on the larger Algæ. Biennial or perennial. Spring and summer. Generally dispersed round the coast.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* a small thin disc. *Fronds* generally tufted, from three to twelve inches in length, varying greatly in diameter, sometimes not thicker than hogs' bristle, sometimes twice or four times as thick, tapering upwards, cylindrical, much branched. *Branches* long and virgate, sometimes undivided, sometimes forked, mostly alternate, imperfectly distichous, or spirally placed, well furnished, in summer, with alternate lateral secondary branches. These secondary branches are sometimes long, and repeatedly pinnate, sometimes short and simply pinnate; sometimes they are absent altogether, and their place supplied by numerous, scattered or clustered, awl-shaped, simple ramuli. These ramuli are rarely absent on the lower parts of the branches

and stem. In winter all the secondary branches fall off, leaving merely the main branches, to which the stumps of the fallen ramuli adhere, and give them a singularly uncouth aspect. In spring the frond pushes out a new series of more slender and decompound ramuli than it had borne the first season. The whole frond is perfectly opake, without any appearance of articulation. *Capsules* ovate, sessile, or on very short peduncles, borne on the pinnules in summer. *Tetraspores* produced both in summer and winter; in summer immersed in the apices of the pinnules, which are then slightly distorted; in winter contained in special receptacles, or *stichidia*, which spring from the sides of the main branches. These stichidia are raised on slender peduncles, forked, and tufted. *Colour* a brownish red, becoming very dark in drying. *Substance* cartilaginous, very rigid in the branches, more flaccid in the ramuli, long resisting the action of fresh water.

This plant is so different in appearance when collected in summer and in winter that it may well be taken by the young botanist for two. The summer specimens are well clothed with slender, multifid and soft ramuli, which lengthen as the season advances, and drop off before winter, leaving bare stems rough with broken stumps.

The *tetraspores* are found either in summer or in winter. At the former season they are simply immersed in the terminal ramuli; at the latter they will be found lodged in small branching *stichidia* scattered irregularly along the sides of the branches.

Except in its much more bushy and branching habit and paler colour, there is a very close resemblance between this species and *R. lycopodioides* (Tab. L.)

Fig. 1. RHODOMELA SUBFUSCA:—*of the natural size.* 2. Pinnated (summer) branchlet with tetraspores in the pinnules. 3. Tufted stichidia (winter) with tetraspores. 4. A tetraspore. 5. Branchlet with capsules. 6. A capsule or ceramidium. 7. Transverse section of the stem:—*all more or less highly magnified.*

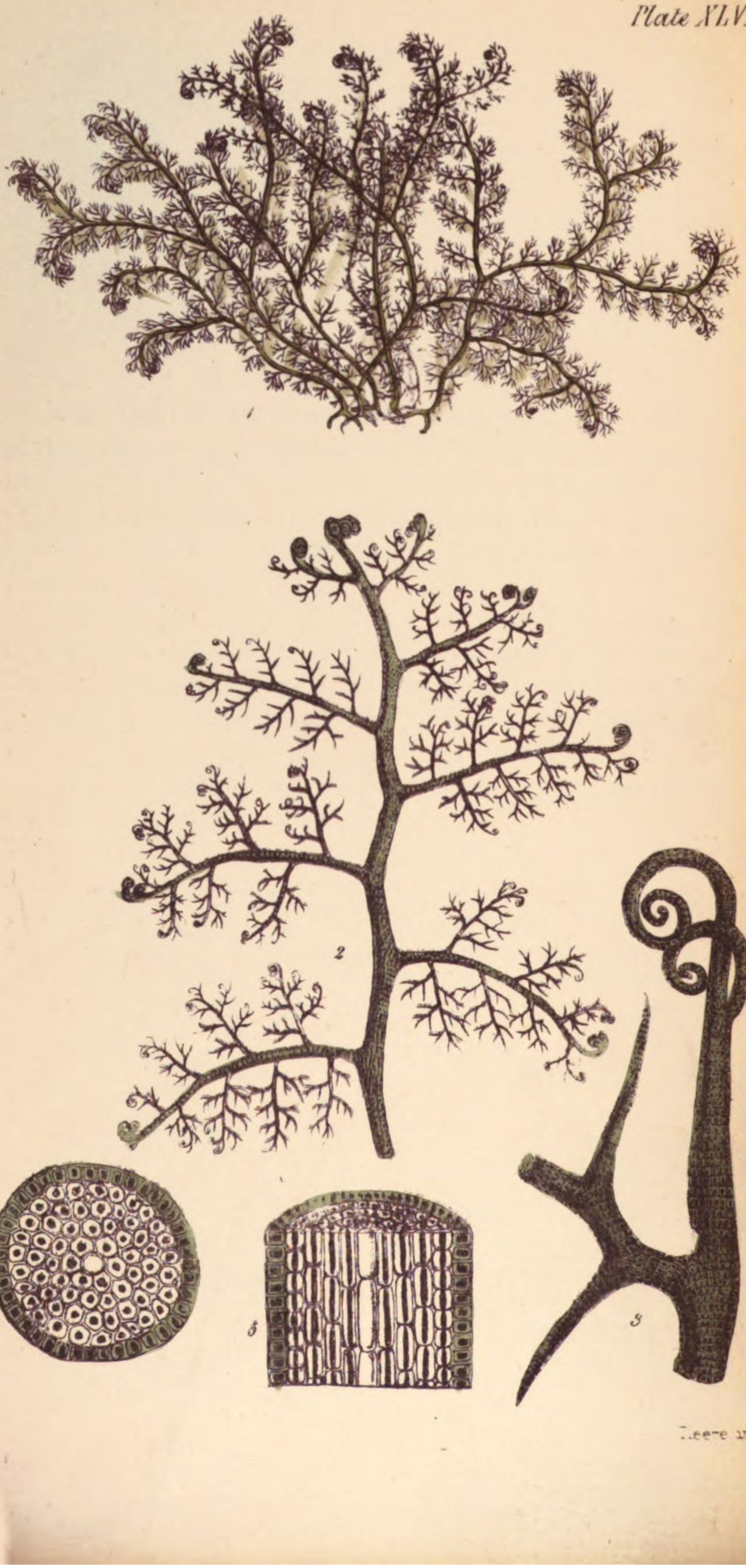
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PLATE XLVIII.

BOSTRYCHIA SCORPIOIDES, *Mont.*

GEN. CHAR. *Frond* dull purple, filiform, much branched, inarticulate, dotted; traversed by a jointed tube surrounded by one or more concentric layers of oblong, coloured cells, which are gradually shorter towards the circumference; the surface cells quadrate. *Fructification* of two kinds, on distinct individuals; 1, "lateral capsules" (*ceramidia*), *Roth*. 2, *tetraspores*, contained in terminal, lanceolate pods. BOSTRYCHIA (*Mont.*),—from βόστρῡχος, a *ringlet*, or *curl of hair*.

BOSTRYCHIA *scorpioides*; frond flexuous, subdichotomous; the branches three or four times pinnated; pinnæ and pinnulæ patent; apices strongly rolled inwards.

BOSTRICHIA scorpioides, *Mont. Hist. Cuba, Bot.* p. 39 (1838).

HELICOTHAMNION scorpioides, *Kütz. Phyc. Gen.* p. 433. t. 53. v.

ALSIDIUM scorpioides, *J. Ag. in Linn.* vol. xv. p. 28. *Endl. 3rd Suppl.* p. 46.

RHODOMELA scorpioides, *Ag. Sp. Alg.* vol. i. p. 380. *Ag. Syst.* p. 200. *Grev. Alg. Brit.* p. 105. *Hook. Br. Fl.* vol. ii. p. 294. *Harv. in Mack. Fl. Hib.* part 3. p. 197. *Harv. Man.* p. 68. *Wyatt, Alg. Danm.* no. 69.

FUCUS scorpioides, *Gmelin, Hist. Fuc.* p. 135.

FUCUS amphibius, *Huds. Fl. Ang.* p. 590. *Stack. Ner. Brit.* p. 86. t. 14. *E. Bot.* t. 1428. *Turn. Syn.* vol. ii. p. 391. *Turn. Hist.* t. 109.

PLOCAMIUM amphibium, *Lamour. Ess.* p. 50.

HAB. On muddy sea shores, near high-water mark; at the estuaries of rivers; in salt water ditches and marshes, adhering to the roots of flowering-plants; also on submarine rocks within tide marks. Annual. Summer. Selsey marshes, *Martyn*. North Wales, *Rev. H. Davies*. Shoreham, on *Atriplex portulacoides, Mr. Borrer*. Mouth of the river Dart, *Mrs. Griffiths*. Tydd marsh, Cambridgeshire, *Mr. Skrimshire*. Shore of Blackwater, near Maldon, *Mr. E. Forster*. Plymouth, Barmouth, Pool near Dolgelly and at the Menai bridge, *Mr. Ralfs*. Port-Stewart, Ulster, *Mr. D. Moore*. Baldoyle, *Mr. M'Calla* and *Mr Bain*. River Shannon, at Tarbert, *Mr. W. Andrews*.

GEOGR. DISTR. Atlantic shores of Europe, from England to Spain.

DESCR. *Fronds* two to four inches high, rather thicker than hogs' bristles, growing in large, entangled tufts, filiform, flexuous, divided at irregular intervals into a few main branches, which are either alternate or subdichotomous, patent, and having their apices rolled into a spiral curl. These branches are beset, at short intervals throughont their extent, with very patent or reflexed, short branchlets, from a quarter to half an inch in length, and much more slender than the main branches. Like the latter, their apices are more or less inrolled, and they are either pinnate or bi-tripinnate, with gradually decreasing patent ramuli, of which the ultimate are subulate and thorn-like. Under the microscope the frond appears to be beautifully

dotted, or clothed with a tessellated membrane. A transverse section (fig. 4.), exhibits a narrow central tube, surrounded by several rows of hexagonal cells, each of which contains a coloured bag; a longitudinal section (fig. 5.), shows that the central tube is jointed at intervals of four to five times its breadth, and that the cells that encompass it become gradually shorter towards the circumference. The *fruit* (which I have not seen) consists of *ceramidia*, which have only been noticed by Roth, by whom they are very imperfectly described; and *stichidia*, or lanceolate pods, terminating the branches, and containing triparted tetraspores. *Colour* purplish, brownish or greenish, according to locality. *Substance* cartilaginous, imperfectly adhering to paper in drying.

In the year 1838, Dr. Montagne, in the botanical portion of M. de la Sagra's history of Cuba, established his genus *Bostrychia* upon *B. scorpioides*, and a tropical species, *B. calamistrata*, with which he has since associated several others, having similar organization; and I wish now to extend the generic character, so as to comprise a little group of southern species, to which I have elsewhere applied the name *Stictosiphonia*, which differ from the type, in having their central tube surrounded by a single row of coloured cells. The genus thus constituted consists of ten species, all of which have a similar habit, and all are found in situations either bordering on high-water mark, or in places where a considerable quantity of fresh water flows into the sea. In this respect they differ from most other *Rhodomeleæ*, a tribe of Algæ the majority of which grow at a considerable depth, and are peculiarly impatient of the contact of fresh water. So little is this the case with our *B. scorpioides* that it has been called *amphibia*, from its sometimes growing in ditches of brackish water, and such also, according to Dr. Hooker, are the situations chosen by *B. vaga*, at Kerguelen's Land.

The name *Helicothamnion*, proposed by Kützing for *B. scorpioides*, must be laid aside, as that of *Bostrychia* has the priority, is equally applicable, and more euphonious. By Prof. J. Agardh this group is included in *Alsidium*, but it scarcely agrees with the character of that genus, and still less with the habits of its species.

Fig. 1. BOSTRYCHIA SCORPIOIDES, a tuft:—*of the natural size.* 2. Part of a branch. 3. Involute apex of the rami, with a portion of a lateral branchlet. 4. Transverse section of a branch. 5. Longitudinal section of the same: —*all more or less highly magnified.*

W H H. del et lith.

Reeve imp

PLATE LXXXV.

RYTIPHLÆA PINASTROIDES, (*Ag.*)

GEN. CHAR. *Frond*, filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*) surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute lanceolate *receptacles* (*stichidia*), in a double row. RYTIPHLÆA (*Ag.*)—from ῥυτὶς, a *wrinkle*, and φλοιὸς, the *bark*; because the surface is transversely wrinkled or striate.

RYTIPHLÆA *pinastroides*; frond terète, irregularly branched; lesser branches pectinato-pinnate; the pinnæ secund, with their apices more or less hooked inwards.

RYTIPHLÆA pinastroides, *Ag. Syn.* p. 25. *J. Ag. Alg. Medit.* p. 145. *Endl.* 3rd *Suppl.* p. 48.

RHODOMELA pinastroides, *Ag. Sp. Alg.* 1. p. 381. *Ag. Syst.* p. 200. *Spreng Syst. Veg.* 4. p. 343. *Grev. Alg. Brit.* p. 104. t. 13. *Hook. Br. Fl.* vol. ii. p. 294. *Wyatt, Alg. Danm.* no. 112. *Harv. Man.* p. 68.

HALOPITHYS pinastroides, *Kütz. Phyc. Gen.* p. 433. t. 52. f. 2.

GIGARTINA pinastroides, *Lyngb. Hyd. Dan.* p. 45.

CERAMIUM incurvum, *Dec. Fl. Fran.* vol. ii. p. 33.

FUCUS pinastroides, *Gm. Hist. Fuc.* p. 127. t. 11. f. 1. *Good.* and *Woodw.* in *Linn. Trans.* vol. iii. p. 222. *Turn. Syn.* vol. ii. p. 346. *Turn. Hist.* t. 11. *Stack. Ner. Brit.* p. 74. *t.* 13. *Eng. Bot. t.* 1042.

FUCUS incurvus, *Huds. Fl. Ang.* p. 590. *With.* vol. iv. p. 115.

HAB. On sub-marine rocks, near low-water mark. Perennial. Winter. On the shores of the south of England, in several places. Jersey, *Miss White*, and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean Sea. "Fœroe Islands," *Lyngbye* (very doubtful). New Zealand, *Sir J. Banks*. Ceylon, *Sir J. E. Smith*.

DESCR. *Root* an expanded, disc. *Fronds* tufted, 4–10 inches in height, cylindrical, about as thick as whip-cord below, much and irregularly branched and bushy, somewhat fastigiate: the main branches alternate or subdichotomous, densely clothed in their lower part with short, subulate, simple, erecto-patent ramuli, which occasionally give a shaggy character to the bases of old fronds; and in their upper, set with elongate, patent or recurved, pectinato-pinnate branches, whose apices are, especially in young fronds, very generally rolled inwards or hooked. These lesser branches are pectinate along their upper side with a double set of subulate ramuli, secundly disposed, generally in pairs, at short intervals, but occasionally somewhat irregularly inserted; all very erect, with straight or hooked apices, and somewhat narrowed at the base.

Both branchlets and ramuli are marked with dark, transverse lines, or spurious articulations, at short intervals, an appearance caused by the articulated, polysiphonous axis of the frond being seen through the subtransparent cells of the periphery. *Fructification*; 1, *ceramidia* ovate, on longish pedicels, borne along the inner faces of the secund ramuli. 2, *Stichidia*, which occupy a similar position on distinct plants, and are shortly stalked, lanceolate, and uncinate. *Tetraspores* triangularly parted. *Substance* cartilaginous and tough; very rigid when dry, and not adhering to paper. *Colour* a dark, dull red, becoming black in dying.

This is one of those plants which, abundant along the shores of southern Europe, reaches its northern limit on the south coast of England; for the report of its having been gathered in the Fœroe Islands, as well as the station "near Dublin," given by Dr. Scott, are, I fear, founded in error. It is assuredly a southern species in its affinities and distribution. We have the high authority of Turner, that it occurs in Ceylon and in New Zealand; otherwise I should have suspected some mistake in these stations also.

The genera *Rytiphlæa*, *Rhodomela* and *Polysiphonia* have so many points of structure in common, and differ by characters of such secondary importance, that it is sometimes a question to which a plant should be referred. The *articulated Polysiphoniæ* indeed, are readily enough distinguished from the species of the two former genera; but it is by an artificial character. For species otherwise closely related, as *P. subulifera* and *P. fruticulosa*, would, were the genus divided on this character, be placed in opposite groups. This would hardly be considered natural. But then it becomes a question how the *inarticulate Polysiphoneæ* are to be separated from the *Rhodomelæ* and *Rytiphlææ*. Natural habit generally decides it, for there is little structural difference. In the true *Rhodomelæ*, indeed, as *R. subfusca*, and *R. lycopodioides*, the absence of a jointed axis, composed of a circle of elongated cells, affords a ready character. But some of the exotic species have more or less evident traces of such a structure. In *Rytiphlæa*, as here defined, this structure exists; and there is nothing to distinguish the group from the inarticulate *Polysiphoniæ*, except the position of the *tetraspores*, and some difference of habit.

Fig. 1. RYTIPHLÆA PINASTROIDES: —*of the natural size.* 2. A branch with *stichidia*. 3. A *stichidium*. 4. A *tetraspore*. 5. A branch with *ceramidia*. 6. A *ceramidium*. 7. *Spores*, from the same. 8. A longitudinal section of the frond. 9. A transverse semi-section of the same:—*all more or less magnified.*

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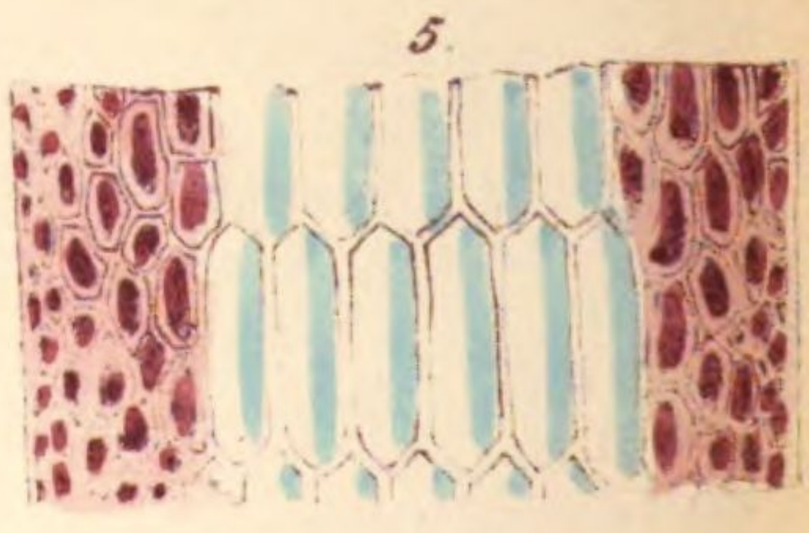

5.

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Reeve Benham & Reeve imp

PLATE CLXX.

RYTIPHLÆA COMPLANATA, *Ag.*

GEN. CHAR. *Frond* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute, lanceolate *receptacles* (*stichidia*), in a double row. RYTIPHLÆA (*Ag.*),—from ρυτις, a *wrinkle*, and φλοιος, the *bark*; because the surface is transversely wrinkled or striate.

RYTIPHLÆA *complanata*; frond brown-red, compressed, pinnate, or bi-tri-pinnate, the lower pinnæ short or abortive, the upper long, straight, erect, virgate, once or twice compounded; pinnulæ subulate, or bifid, erect, closely-set; the axils acute.

RYTIPHLÆA complanata, *Ag. Sp. Alg.* vol. ii. p. 54. *J. Ag. in Linn.* vol. xv. p. 26. *J. Ag. Alg. Medit.* p. 146. *Endl. 3rd Suppl.* p. 48. *Harv. Ner. Austr.* p. 32.

POLYSIPHONIA cristata, *Harv. in Mack. Fl. Hib.* part 3. p. 205. *Harv. Man.* p. 85.

FUCUS cristatus, var. γ. articulatus, *Turn. Hist.* t. 23. *f. h.*

PLOCAMIUM cristatum, *Lamour. Ess.* p. 50. t. 5. f. 1, 2, 3.

HAB. On the rocky beds of shallow tide-pools, exposed, at low-water, to full sunshine, among *Corallina officinalis*, &c. Perennial? Summer. Very rare. Bantry Bay, *Miss Hutchins*. Caarush Point, Miltown Malbay, abundant in one or two tide-pools, but very local, *W. H. H.* (1847). Whitsand Bay, *Dr. Jacob*. Dredged in Plymouth Sound, *Rev. W. S. Hore*.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea. South of England and Ireland. Cape of Good Hope.

DESCR. *Root*, a mass of branched, creeping, and clasping fibres. *Fronds* densely tufted, from two to four inches high, about half a line in breadth, plano-compressed, simple, or once forked below, flabellately branched, or more or less pinnate, or bi-tri-pinnate above. Lower portion of the stem either naked, or set with short subulate or pinnatifid ramuli; upper branches pinnate with branchlets, which increase in length and in *composition* upwards, the lowermost being simple, the upper pinnatifid, and the uppermost more compound still. All the divisions are strictly alternate and distichous, and the whole frond is marked with arching, transverse striæ, or dark lines, placed at distances of about half the diameter asunder: these indicate the joints of the internal axis, seen through the cells of the surface. *Ramuli* subulate, the older ones becoming bifid, and gradually multifid. I have seen no fruit on British specimens. *Substance* cartilaginous, not closely

adhering to paper. *Colour* a dull brownish or somewhat purplish-red; becoming much darker in drying. Unless the specimens of this plant be allowed to remain some hours in fresh-water, they will stain the paper on which they may be laid, dull brown, and will themselves turn completely black and rigid, and refuse to adhere to the paper: by steeping, a large quantity of brown, offensive matter is discharged, and specimens so treated preserve a shade of red, and adhere to paper.

A very rare plant on the British shores, though frequent in the south of Europe. I believe it was first noticed by the late Miss Hutchins of Bantry, who communicated specimens to Mr. Turner, by whom they were regarded as an articulated variety of *Fucus cristatus*, the *Rhodymenia cristata* of modern writers. That so singular a mistake should have been committed by an author of so much judgment and knowledge of his subject as Mr. Turner, only shows the imperfect microscopic examination to which marine plants were at that time subjected. The resemblance between these species is merely an outward one; the structure is very different. In our modern system, therefore, instead of being regarded as varieties of one species, they are placed in widely separated genera.

The present plant has a structure very similar to that of a *Polysiphonia*, in which genus I formerly placed it. Indeed, except that we have here an external coating of cells, there is nothing to distinguish it from an ordinary *Polysiphonia*. It is very closely allied to *Pol. fruticulosa* and *P. thuyoides* of authors, and as these are of exactly similar structure, I propose to transfer them also to the genus *Rytiphlæa*, to which group ought to be added all completely inarticulate species of *Polysiphonia*.

Our figure is made from a specimen gathered at Miltown Malbay, where, in one or two stations, I was so fortunate as to meet with this beautiful plant in considerable abundance, last summer. It completely clothed the rocky bottom of a tide-pool, four or five yards in diameter, and from three to six inches in depth. Where the water became deeper the plant disappeared.

Fig. 1. RYTIPHLÆA COMPLANATA:—*of the natural size.* 2. Portion of a branch. 3. Portion of the surface. 4. Transverse section of the frond. 5. Longitudinal section of the same:—*all more or less magnified.*

W.H.H. del et lith.

R.B & R. imp.

PLATE CCXXI.

RYTIPHLÆA THUYOIDES, *Harv.*

GEN. CHAR. *Frond* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute, lanceolate *receptacles* (*stichidia*) in a double row. RYTIPHLÆA (*Ag.*),—from ρυτις, a *wrinkle*, and φλοιος, the *bark*, because the surface is transversely wrinkled or striate.

RYTIPHLÆA *thuyoides*; stems erect, rising from creeping fibres, terete; below simple and set with short, spine-like ramuli; above much branched; branches alternate, very erect, bi-pinnate; pinnæ multifid or pinnulate; axils rounded; ceramidia ovate, sessile, densely set.

POLYSIPHONIA thuyoides, *Harv. in Mack. Fl. Hib.* part 3. p. 205. *Wyatt, Alg. Danm.* no. 305. *Harv. Man.* p. 86. *E. Bot. Suppl.* t. 2882.

GRAMMITA rigidula, *Bonnem.*

HAB. In pools left by the tide, growing either on the rocky bottom or on Corallines and other small Algæ. Perennial. Summer. Abundant on the west coast of Ireland. Portrush, *Mr. Moore*. Howth and Balbriggan, *Miss Gower*. Ayrshire coast, *Mr. Thompson and Rev. D. Landsborough*. South coast of England, Devonshire, *Mrs. Griffiths*. Mountsbay and Ilfracombe, *Mr. Ralfs*. Jersey, *Miss White*.

GEOGR. DISTR. Atlantic shores of Europe.

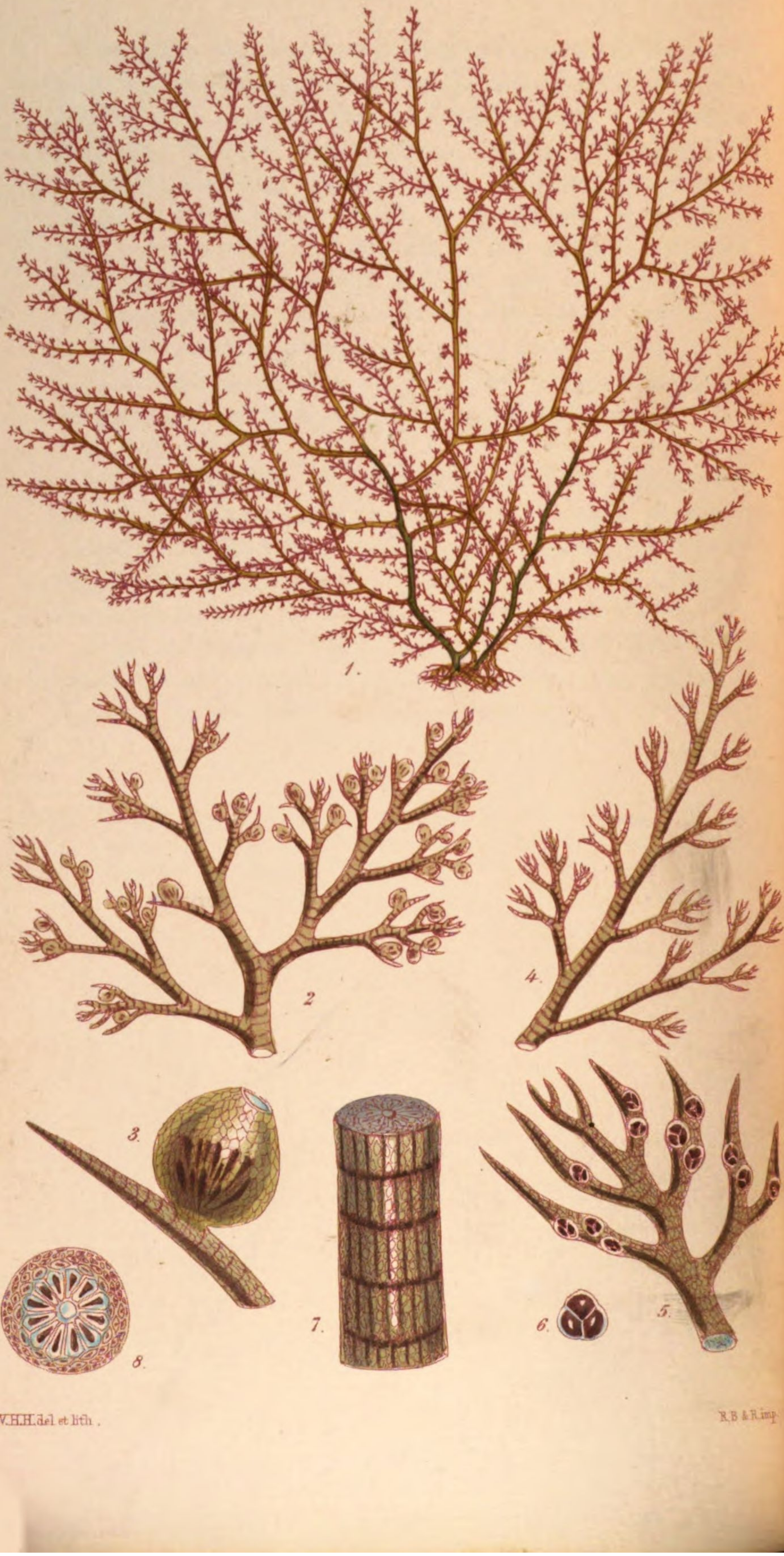
DESCR. *Root*, a widely spreading mass of creeping fibres. *Fronds* from three to six inches high, twice as thick as hog's bristle, forming wide, but not very crowded tufts. *Stems* very variable in division: in some specimens nearly simple, with three or four long, rod-like branches, set with very short pinnulate ramuli; in others naked at the base, but closely and regularly pinnated or bipinnated from the middle upwards, the pinnæ long and virgate, closely pinnulate. Other specimens are excessively bushy, the branches springing from the upper part of the stem in a very irregular manner. In all varieties the branches are remarkably erect, and generally straight, and more or less regularly pinnate or bipinnate. *Ramuli* below simple and subulate, above pinnulate and forked, one or two lines long. The whole frond is marked with transverse striæ at distances about equal to the diameter, and the surface is reticulated with anastomosing cells. *Fructification*; *ceramidia* oblong-ovate, densely crowded on the ramuli, sessile, containing a tuft of pear-shaped spores. *Tetraspores* in distorted ramuli. *Substance* somewhat rigid, between cartilaginous and membranaceous. *Colour*, a fine dark brownish purple, becoming more or less tinted with olive when exposed to sunlight.

From *Rytiphlæa complanata* this species may always be known by its darker colour, cylindrical stems, and generally by a narrower frond. In ramification and general habit there is much similarity. The two may sometimes be found growing in close proximity, and even mixed together, but I have generally observed that *R. thuyoides*, which is the stiffest in substance, usually grows in the shallow parts of the tide-pool, sometimes standing out of the water; while *R. complanata* never dries during the recess of the tide. On the west coast of Ireland this is a very abundant plant, growing on most rocky shores. It forms dense tufts of large size, but is often much stunted, and is only to be found well grown in the deeper pools near low-water mark.

From *R. fruticulosa* the erect habit and more regularly pinnate ramification distinguish it. In some specimens these characters are less strikingly manifest than in others, but it rarely happens that the branching is so patent or irregular as to cause the specimens to be mistaken for one of the former species.

Small specimens of *Polysiphonia nigrescens* much resemble the present species in habit, but are at once known under the microscope, by the very different structure of the frond.

Fig. 1. RYTIPHLÆA THUYOIDES:—*of the natural size.* 2. Branch with *Ceramidia.* 3. *Ceramidia.* 4, 5. Branchlets from different specimens. 6. Portion of the stem. 7. Transverse section of the same:—*all more or less magnified.*



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W.H.H. del et lith.

R.B & R. imp.

PLATE CCXX.

RYTIPHLÆA FRUTICULOSA, *Harv.*

GEN. CHAR. *Frond* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute lanceolate *receptacles* (*stichidia*), in a double row. RYTIPHLÆA (*Ag.*),—from ρυτις, a *wrinkle*, and φλοιος, the *bark*; because the surface is transversely wrinkled or striate.

RYTIPHLÆA *fruticulosa;* stems diffuse, branched from the base; branches divaricating pinnato-dichotomous, set in the lower part with short, horizontal, multifid ramuli; in the upper more or less pinnated with larger, similarly divided branchlets; axils rounded; ceramidia ovate, sessile, densely set; tetraspores in distorted ramuli.

POLYSIPHONIA fruticulosa, *Spreng. Syst. Veg.* vol. iv. p. 350. *Duby, Bot. Gall.* p. 966. *Harv. in Mack. Fl. Hib.* part 3. p. 205. *Harv. in Hook. Br. Fl.* vol. ii. p. 327 (*in part*). *Harv. Man.* p. 86. *Wyatt, Alg. Danm.* no. 132. *Mont. Crypt. Alg.* n. 19. *Fl. Alg.* p. 81. *Mont. Crypt. Canar.* p. 170. *Endl. 3rd Suppl.* p. 46.

POLYSIPHONIA Wulfeni, *Ag. Alg. Medit.* p. 144. *Kütz. Phyc. Gen.* p. 431.

HUTCHINSIA fruticulosa, *Ag. Syst.* p. 27.

HUTCHINSIA Wulfeni, *Ag. Sp. Alg.* vol. ii. p. 95.

GRAMMITA Wulfeni, *Bonn. Hyd.* p. 27.

CERAMIUM Wulfeni, *Roth, Cat. Bot.* vol. iii. p. 140.

FUCUS fruticulosus, *Wulf. in Jacq. Col.* p. 159. t. 16. *Crypt. Ag.* p. 56. *Esper, Ic. Fuc.* p. 165. t. 87. *Clem. Ess.* p. 319. *E. Bot.* t. 1686. *Turn. Syn. Fuc.* vol. ii. p. 394. *Turn. Hist.* t. 227.

HAB. In pools left by the tide, growing on the rocky bottom, or on Corallines and other small Algæ. Perennial. Summer. Common on the western and southern shores of the British Islands.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. Northern coasts of Africa. Canary Islands.

DESCR. *Root* a mass of creeping, entangled fibres. *Fronds* forming large, globose tufts, often six inches in diameter, composed of a great number of separate stems intertwined together. *Stems* 4–6 inches long, twice as thick as hog's bristle, gradually attenuated upwards, branched from the base and bushy. Main *branches* somewhat dichotomous, spreading at wide angles; the upper and small divisions repeatedly pinnate, or irregularly branched. The lower branches are furnished with alternate, multifid ramuli, a line or two in length and very patent; the upper more regularly pinnate with longer branchlets, which are set with simple or multifid subulate ramuli. Every part of the frond is marked by dark-coloured transverse striæ, set at

short distances asunder (revealing the joints of the internal axis), and the whole surface is reticulated with anastomosing cells. *Fructification*: 1, *Ceramidia*, densely crowded on the ramuli, ovate, sessile; rarely produced: 2, tetraspores imbedded in the multifid, lateral ramuli. *Substance* cartilaginous and firm, the tips of the branches standing out, and each retaining a drop of water when the specimen is lifted into air. *Colour* a dark purple, changing into olive green, and finally to amber-yellow under the influence of sunlight.

I have always thought that in whatever genus we put *Rytiphlæa complanata* of Agardh, in the same we must place not only the *Polysiphonia thuyoides* of British authors, but *P. fruticulosa* also. The internal structure of these plants is identical. They all possess a central jointed axis composed of many tubes, like the frond of *Polysiphonia*, coated on the outside by a broad band of small irregular cells. The surface appears reticulated under the microscope, and marked at short intervals by dark-coloured transverse lines. These characters belong to the frond of *Rytiphlæa*, in which genus Agardh places the first of the three plants in question; while both the latter have hitherto been referred to *Polysiphonia*. As I have already (Pl. CLXX.) adopted Agardh's name for the former, I am now constrained to alter the position of the two latter, and transfer them from *Polysiphonia* to *Rytiphlæa*. These three plants have not only a similar structure, but have so much the same natural habit, that specimens may be found which bring them *inconveniently* near each other. Some specimens of *R. fruticulosa* are very close to some of *R. thuyoides*, and the latter, in like manner, closely approaches narrow states of *R. complanata*. So nearly do they approach, that at one time I regarded them all as merely sportive forms of one species, but this was before I had much opportunity of studying them in a living state. When growing, each possesses characters sufficiently obvious. It is only in a few cases of imperfect or badly dried specimens that the student will find it difficult to decide to which species the specimen should be referred.

The ceramidia of this species are not often found, but when they occur they are generally formed in profusion, almost every twig bearing one or two. They are always borne on less luxuriant specimens than those which yield tetraspores.

Fig. 1. RYTIPHLÆA FRUTICULOSA:—*of the natural size.* 2. Small branch with ceramidia. 3. A ceramidium *in situ.* 4. Small branch from another plant. 5. Ramulus with imbedded *tetraspores.* 6. Tetraspore. 7. Portion of the stem. Section of the same:—*all more or less magnified.*

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PLATE CLXVII.

POLYSIPHONIA URCEOLATA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *urceolata*; filaments rigid, setaceous, full-red, much branched, loosely bundled; branches dichotomous, more or less furnished with short, alternate, patent or recurved ramuli; articulations marked with two broad tubes, those of the main branches 3–5 times longer than broad; siphons four, surrounding a minute cavity; capsules pitcher-shaped, with a produced mouth, generally stalked; tetraspores in the upper part of the ramuli.

POLYSIPHONIA urceolata, *Grev. Fl. Edin.* p. 309. *Harv. in Hook. Br. Fl.* vol. ii. p. 330. *Wyatt, Alg. Danm.* no. 133. *Harv. in Mack. Fl. Hib.* part 3. p. 207. *Harv. Man.* p. 95. *Endl. 3rd Suppl.* p. 45.

POLYSIPHONIA patens, *Harv. in Hook. Br. Fl.* vol. ii. p. 330. *Endl. 3rd Suppl.* p. 54.

HUTCHINSIA urceolata, *Hook. Fl. Scot.* vol. ii. p. 88. *Lyngb. Hyd. Dan.* p. 110. t. 34. *Ag. Syst.* p. 151. *Ag. Sp. Alg.* vol. ii. p. 70.

HUTCHINSIA patens, *Ag. Sp. Alg.* p. 71.

CONFERVA urceolata, *Dillw.* no. 156. t. G. *E. Bot.* t. 2365.

CONFERVA patens, *Dillw.* no. 157. t. G.

HAB. On rocks near low-water mark, and on the stems of *Laminaria digitata*. Annual Summer. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic shores of Northern Europe. Iceland. North America.

DESCR. *Fronds* densely tufted, often entangled at base, and connected by root-like fibres, from three to nine inches long, as thick as horsehair at base, gradually attenuated upwards, much and irregularly branched, often very bushy. Main branches somewhat dichotomous, more or less furnished with short, lateral, simple, or sparingly divided patent ramuli, which bear a few thorn-like, lesser divisions. Sometimes these thorn-like ramelli are very abundant, and hooked backwards, when the plant becomes *P. patens* of authors; at other times they are few and more erect. *Articulations* very different in different parts of the frond: those of the lower part of the stem about as long as broad; of the branches generally thrice, but sometimes five times as long; and of the ramuli, rather shorter than their breadth; all marked by two wide tubes, and exhibiting, when cut transversely, four siphons surrounding a minute cavity. *Capsules* on short stalks,

elegantly urn-shaped. *Tetraspores* forming a row in the upper half of the ultimate ramuli, and generally extending to the apex. *Colour* a full, deep red, becoming much darker, and even black in drying. *Substance* rigid, not strongly adhering to paper.

Polysiphonia urceolata is subject to some minor variations, according to the locality in which it grows. When found on rocks, in exposed situations, near low-water mark, the filaments are more robust, of greater length, and much more branching; these constitute the typical form of the species, as restricted by Agardh. When growing on the stems of *Laminaria digitata* the filaments are much less branched, the lateral branches shorter, and the ramuli remarkably squarrose, often hooked backwards. Such specimens constitute the *P. patens* of Agardh, and are well represented in Lyngbye's figure quoted above. To the naked eye the extreme states of these two varieties are sufficiently characterised, but various intermediate forms insensibly connect them, and I have found it impossible to discover any satisfactory distinction between them. The *Conferva patens* of Dillwyn appears to be merely the young state of the plant.

Fig. 1. POLYSIPHONIA URCEOLATA; tuft:—*of the natural size.* 2. Branch with capsules. 3. A capsule. 4. Branch with tetraspores. 5. Ramulus from the same. 6. A tetraspore. 7. Portion of a branch and ramulus, to show the comparative length of the joints. 8. Portion of the lower part of the stem, to show the same. 9. Cross-section of a filament:—*all more or less highly magnified.*

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PLATE CLXVIII.

POLYSIPHONIA FORMOSA, *Suhr*.

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), — from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *formosa*; filaments exceedingly slender and flaccid, full-red, much divided; branches subdichotomous, long, flexuous, more or less furnished with scattered, spreading, alternate, subulate ramuli; articulations marked with two broad tubes, those of the main branches many times (5–10 times) longer than broad, of the ramuli short; siphons four, surrounding a minute cavity; capsules urceolate, generally stalked; tetraspores imbedded in the middle part of the ramuli.

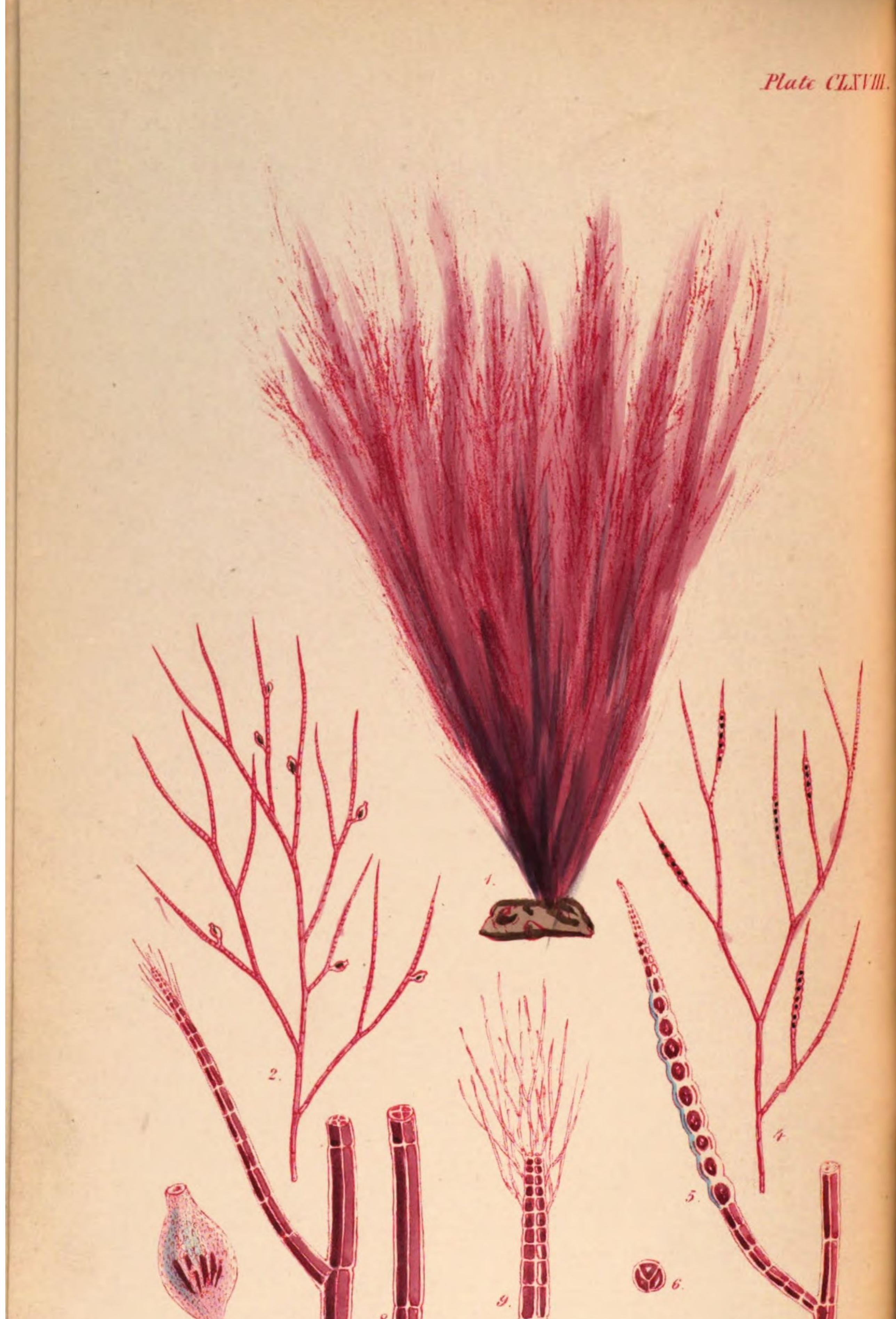
POLYSIPHONIA formosa, *Suhr. Bot. Zeit.* 1831, p. 709. *Harv. Man.* p. 94. *Wyatt, Alg. Danm.* no. 216.

POLYSIPHONIA gracilis, *Grev. MSS.*

HAB. On rocks, near low-water mark. Annual. Summer. Not uncommon. Lerwick, Shetland, *Suhr*. Bute, *Dr. Greville*. Belfast Bay, *Mr. Thompson*. Antrim, *Mr. D. Moore*. Clontarf, *Miss Ball*. Galway, *Mr. M'Calla*. Malahide, *W.H.H.* River Dart, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. S. Hore, and Dr. Cocks*. Whitsand Bay, *Dr. Jacob*. Sidmouth, *Rev. R. Cresswell*.

GEOGR. DISTR. Atlantic shores of Northern Europe. Baltic Sea.

DESCR. *Filaments* densely tufted, from six to ten inches in length, the larger specimens as slender as a human hair, the smaller and more delicate much more slender, excessively branched, in a manner between alternate and dichotomous; branches three or four inches long, flexuous, several times divided, the penultimate divisions more or less furnished with alternate, patent, subsimple ramuli, ultimate ramuli subulate, spreading. *Apices* blunt, and often clothed with byssoid fibres. *Articulations* very variable in different parts of the frond; those of the stem about twice as long as broad; of the main branches from eight to ten times; of the smaller branches from four to five times; and of the ramuli about once and half as long as broad. *Interstices* pellucid. *Capsules* urceolate, scattered on the sides of the upper ramuli. *Tetraspores* forming a line in the middle of the ramuli, which then become fusiform. *Colour* a full, deep, and somewhat pinky-red, becoming red-brown, or very dark, in drying. *Substance* flaccid, membranous, or, when young, somewhat gelatinous, closely adhering to paper, and somewhat glossy when dry.



W. H. Hooker del et lith.

Reeve, Benham, & Reeve imp.

PLATE CLXVIII.

POLYSIPHONIA FORMOSA, *Suhr*.

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), — from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *formosa*; filaments exceedingly slender and flaccid, full-red, much divided; branches subdichotomous, long, flexuous, more or less furnished with scattered, spreading, alternate, subulate ramuli; articulations marked with two broad tubes, those of the main branches many times (5–10 times) longer than broad, of the ramuli short; siphons four, surrounding a minute cavity; capsules urceolate, generally stalked; tetraspores imbedded in the middle part of the ramuli.

POLYSIPHONIA formosa, *Suhr. Bot. Zeit.* 1831, p. 709. *Harv. Man.* p. 94. *Wyatt, Alg. Danm.* no. 216.

POLYSIPHONIA gracilis, *Grev. MSS.*

HAB. On rocks, near low-water mark. Annual. Summer. Not uncommon. Lerwick, Shetland, *Suhr*. Bute, *Dr. Greville*. Belfast Bay, *Mr. Thompson*. Antrim, *Mr. D. Moore*. Clontarf, *Miss Ball*. Galway, *Mr. M'Calla*. Malahide, *W.H.H.* River Dart, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. S. Hore, and Dr. Cocks*. Whitsand Bay, *Dr. Jacob*. Sidmouth, *Rev. R. Cresswell*.

GEOGR. DISTR. Atlantic shores of Northern Europe. Baltic Sea.

DESCR. *Filaments* densely tufted, from six to ten inches in length, the larger specimens as slender as a human hair, the smaller and more delicate much more slender, excessively branched, in a manner between alternate and dichotomous; branches three or four inches long, flexuous, several times divided, the penultimate divisions more or less furnished with alternate, patent, subsimple ramuli, ultimate ramuli subulate, spreading. *Apices* blunt, and often clothed with byssoid fibres. *Articulations* very variable in different parts of the frond; those of the stem about twice as long as broad; of the main branches from eight to ten times; of the smaller branches from four to five times; and of the ramuli about once and half as long as broad. *Interstices* pellucid. *Capsules* urceolate, scattered on the sides of the upper ramuli. *Tetraspores* forming a line in the middle of the ramuli, which then become fusiform. *Colour* a full, deep, and somewhat pinky-red, becoming red-brown, or very dark, in drying. *Substance* flaccid, membranous, or, when young, somewhat gelatinous, closely adhering to paper, and somewhat glossy when dry.

This species is, as may be seen from the magnified figures in our plate, very closely related to the subject of the previous plate, and it is for this reason that I have figured them consecutively. *P. formosa* differs from *P. urceolata* chiefly in the much greater tenuity of its filaments, and the greater proportional length of its joints; it agrees with that species in its colour, its ramification and the peculiar form of its capsules. Were we merely to take into consideration the beautifully feathered and luxuriant specimens collected by Dr. Greville on the shores of Bute, and compare them with the coarse growing state of *P. urceolata* commonly met with, we should probably pronounce the two species to be broadly distinguished, and should anticipate no difficulty in determining between them. But it must be admitted that specimens do occur which show a much greater approach both in habit and character; and while I am unwilling to erase *P. formosa* from the list altogether, I am obliged to allow that I have seen individual specimens which it has puzzled me to say whether they ought to be referred to *urceolata* or *formosa*. When such perplexities meet us on the shore, one is apt to conclude that specific division has been carried too far. In the majority of cases, however, the limits are sufficiently marked. *P. formosa* appears to be a plant of bays and estuaries; *P. urceolata*, of the more exposed parts of the coast; and, whether we look on them as different species or as well-marked varieties of one species, they appear to be worthy of separate notice.

Fig. 1. POLYSIPHONIA FORMOSA; tuft:—*of the natural size.* 2. A branch with capsules. 3. A capsule. 4. A branch with tetraspores. 5. Ramulus of the same. 6. A tetraspore. 7. Portion of a branch, with ramulus. 8. Portion of a main branch. 9. Apex of a young ramulus, with byssoid fibres. 10. Cross section of the filament:—*all more or less highly magnified.*

PLATE CII. *A*.

POLYSIPHONIA OBSCURA, *J. Ag.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate capsules (*ceramidia*), furnished with a terminal pore, and containing a mass of pear-shaped spores. 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), from πολὺς, *many*, and σίφων, *a tube*.

POLYSIPHONIA *obscura*; densely matted together, filaments creeping, throwing up erect, simple, secund branches, which are either naked or furnished with a few secund ramuli; articulations as long as broad, many-tubed.

POLYSIPHONIA obscura, *J. Ag. Alg. Medit.* p. 123. *Endl. 3rd Suppl.* p. 44.

HUTCHINSIA obscura, *Ag. Sp.* vol. ii. p. 108.

CONFERVA intertexta, *Roth, Cat. Bot.* vol. i. p. 188. t. 3. f. 5. vol. ii. p. 214.

HAB. Spreading over marine rocks, at half-tide level; also parasitical on *Fuci*, and on some of the smaller Algæ. Jersey, *Miss White*. On the sheltered side of a lofty rock, near Sidmouth, *Rev. Mr. Cresswell*.

GEOGR. DISTR. Coast of Spain, at Cadiz, *Ag*. Adriatic Sea.

DESCR. Plant spreading over the surface of rocks, in patches of six inches to a foot in diameter, covering the roots of such *Fuci* as it may encounter. *Filaments* decumbent, attached by means of rooting processes, which issue at intervals from the lower surface, subsimple, throwing up from the upper surface erect, secund branches, from a quarter to half an inch in length, quite simple, and tapering to a fine point, naked, or furnished with three or four secund simple ramuli. *Articulations* visible in all parts of the frond, about as long as broad, or rather shorter, composed of twelve or thirteen radiating tubes. The fruit I have not seen on British specimens. *Colour*, dark brown-red. *Substance* rigid, imperfectly adhering to paper.

This interesting addition to the British Flora, was made by Miss White, who detected, in 1846, a single specimen growing among the roots of *P. fibrata*, at Jersey. More recently it has been gathered in great abundance by the Rev. Mr. Cresswell, in a station near Sidmouth, and to his kindness I am indebted for numerous specimens, gathered at various seasons.

I had, at first, confounded it with *P. secunda*, Mont., a plant to which, outwardly, it bears a strong resemblance, but from which it differs in the length, and composition of the articulations. I have now minutely compared the British specimens with one of *P. obscura*, received from Prof. J. Agardh, and find them to agree in all essential particulars; ours are, however, rather more robust than the Adriatic plant, and the joints slightly shorter.

A. Fig. 1. POLYSIPHONIA OBSCURA; part of a patch:—*of the natural size.* 2. Portion of a creeping filament:—*moderately magnified.* 3. Portion of a branch. 4. Cross section of the same:—*both highly magnified.*

PLATE CII. *B.*

POLYSIPHONIA PULVINATA, *Spreng.*

POLYSIPHONIA *pulvinata*; filaments rising from a mass of creeping fibres, tufted and interwoven, short, very slender, flexuous, sparingly and irregularly dichotomous, more or less furnished with very patent or recurved, simple ramuli; articulations of the main branches three or four times as long as broad, of the ramuli very short, four-tubed; capsules urn-shaped, stalked.

POLYSIPHONIA pulvinata, *Spreng. Syst. Veg.* vol. iv. p. 350. *J. Ag. Alg. Medit.* p. 124. *Mont. Fl. Canar.* p. 172. *Endl. 3rd Suppl.* p. 44. *Harv. Man.* p. 94. *Wyatt, Alg. Danm.* no. 215.

POLYSIPHONIA macrocarpa, *Harv. in Mack. Fl. Hib.* part 3. p. 296.

HUTCHINSIA pulvinata, *Ag. Sp. Alg.* vol. ii. p. 109.

CONFERVA pulvinata, *Roth. Cat.* vol. i. p. 187. t. 3. f. 4. vol. ii. p. 214.

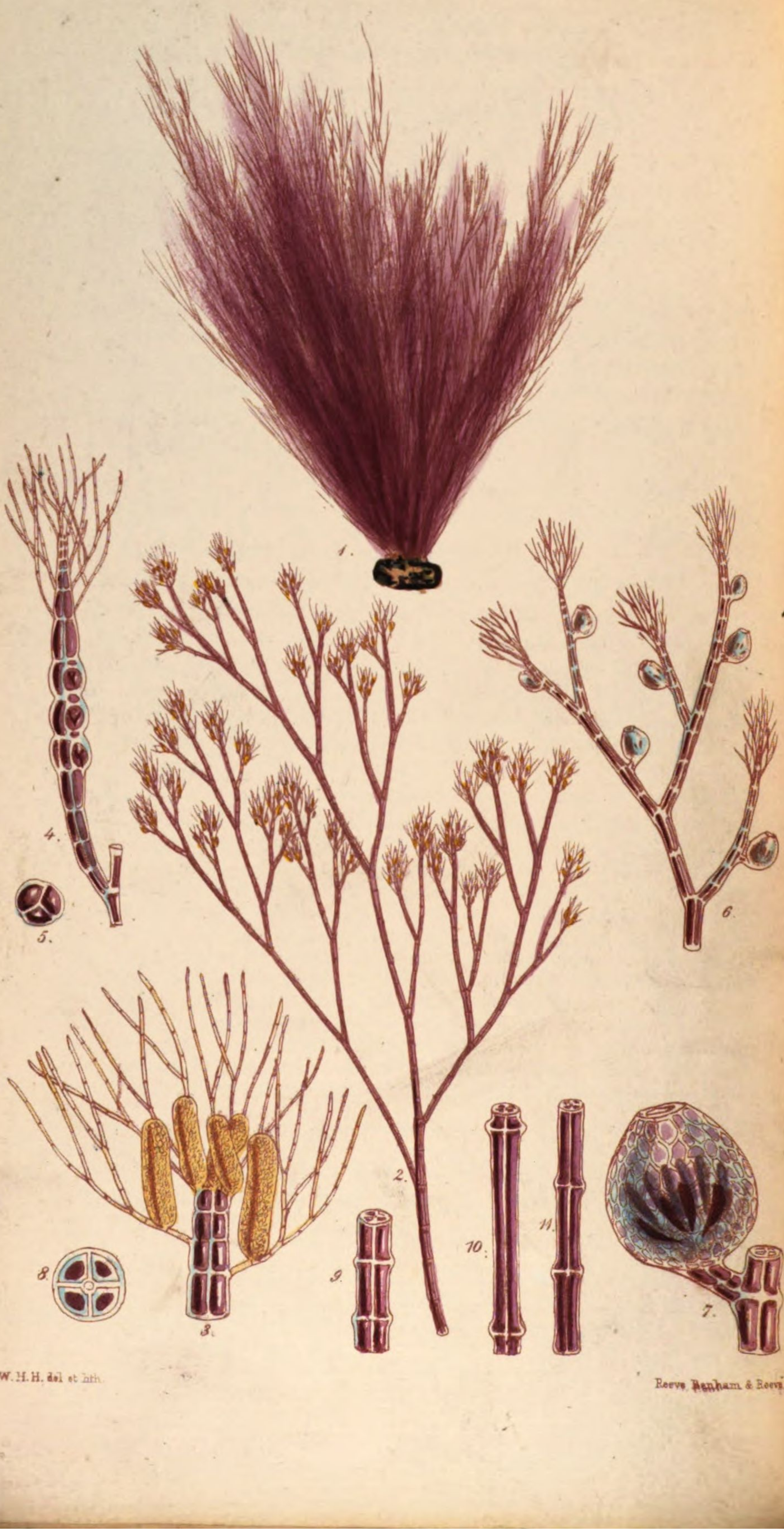
HAB. On rocks in the sea, between tide marks. Annual. Not uncommon. Miltown Malbay, *W. H. H.* Port Stewart, *Mr. D. Moore.* Ilfracombe and Torbay, *Mrs. Griffiths.* Salcombe, Lands-End and Mount's Bay, *Mr. Ralfs.* Balbriggan, *Miss Gower.* Saltcoats, *Mr. D. Landsborough, Jun.* Ardrossan, *Major Martin.*

GEOGR. DISTR. Atlantic and Mediterranean coasts of Europe. Canary Islands.

DESCR. *Filaments* rising from creeping fibres, densely aggregated in roundish, fastigiate tufts, about an inch in height, very slender and flaccid, flexuous, irregularly branched; branches more or less dichotomous, furnished irregularly with scattered, alternate or now and then secund, very patent, or divaricating, short ramuli, which are mostly simple, occasionally subdivided. *Articulations* variable in length; those of the main divisions three to four times, of the lesser branches twice or thrice, and of the ramuli half as long as broad, all marked with two broad, coloured bands, and composed of four tubes radiating round a central cavity. *Capsules* large in proportion to the diameter of the filaments from which they spring, urn-shaped, with a contracted orifice, borne on short lateral stalks. *Tetraspores* imbedded in the ramuli in a single row. *Colour* a dark red-brown. *Substance* soft and somewhat gelatinous, closely adhering to paper.

This resembles *P. urceolata* in miniature, but has the soft substance of *P. fibrata*, and is a much more slender plant.

B. Fig. 1. POLYSIPHONIA PULVINATA; a tuft:—*of the natural size.* 2. Portion of a filament:—*moderately magnified.* 3. A ramulus with *tetraspores.* 4. Portion of a branch, with capsule. 5. Transverse section of a branch: *all highly magnified.*



W. H. H. del et lith.

Reeve, Benham & Reeve imp.

PLATE CCVIII.

POLYSIPHONIA FIBRATA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals; 1, ovate capsules (*ceramidia*), furnished with a termina pore, and containing a tuft of pear-shaped *spores*; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*) — from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *fibrata*; stems setaceous below, much attenuated upwards, flaccid, gelatinous, simple or alternately branched, bearing at greater or less distances, dichotomously divided, more or less pencilled ramuli, whose tips are fibrilliferous; axils patent; articulations bistriate, variable in length, those in the principal branches four to six times longer than broad; siphons four, surrounding a minute central cavity; capsules ovate, usually pedunculate.

POLYSIPHONIA fibrata, *Harv. in Hook. Br. Fl.* vol. ii. p. 329. *Harv. in Mack. Fl. Hib.* part 3. p. 206. *Harv. Man.* p. 93. *Wyatt, Alg. Danm.* no. 39. *Kütz. Phyc. Gen.* p. 426. *Endl. 3rd Suppl.* p. 45.

HUTCHINSIA allochroa β. fibrata, *Ag. Syst.* p. 154.

CONFERVA fibrata, *Dillw. Conf. Syn.* p. 84. t. G.

HAB. On rocks, muscle shells, &c., near low water mark, either in tide-pools or exposed places. Annual. Summer and Autumn. Frequent on the British coasts.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root*, a mass of branched and matted fibres. *Fronds* very densely tufted, from two to six or eight inches in length, as thick as hogs' bristle at the base, gradually attenuated upwards to a capillary or byssoid fineness, irregularly dichotomous or alternately branched; branches more or less divided, either indefinitely decompound or bearing along their divisions lateral multifid ramuli, which sometimes are dense and pencilled, in other specimens more lax and simpler. *Articulations* visible throughout the whole plant; twice as long as broad below; six or eight times as long in the middle of the stem; three or four times in the upper branches; and scarcely twice as long as broad in the ramuli:—marked with two wide, coloured tubes, separated by narrow pellucid spaces. *Siphons* four, containing coloured bags, and surrounding a minute central cavity. *Apices* of the branches and ramuli terminating in a tuft of byssoid, dichotomous fibres. *Ceramidia* ovate, with a wide mouth, pedunculate, abundantly scattered over the upper branches, containing a tuft of pear-shaped spores. *Tetraspores* small, in distorted ramuli. *Antheridia* oblong, obtuse, yellow, growing from the apical fibres and clustered round the tips of the branches. *Colour*,

a dark red-brown, sometimes becoming purple in drying; the colouring matter soon given out in fresh water, to which it imparts a rosy hue. *Substance* very tender and gelatinous, soon decomposing. *Odour* offensive.

The species here figured, originally defined by Mr. Dillwyn in the supplement to his work on the British Confervæ, appears to be well understood by most British botanists, who are sufficiently familiar with its characters from the excellent specimens published by Mrs. Wyatt. It is pretty generally dispersed on the British coasts, and must be regarded as one of our commonest species of *Polysiphonia*. I am not clear, however, that it is equally well understood on the continent, and have reason to believe that it is known in different places under several different names; but in the present state of our knowledge of the *Polysiphoniæ*, I have not ventured to bring together any supposed synonyms. The genus is a very extensive one—and its species put on, at different ages, a great variety of forms. These, if gathered isolated one from another, or by persons who are more desirous of recording novelties than of tracing out the true relations of vegetable forms, may often be made to pass for new species; while they would, if carefully watched in their place of growth, soon put on the peculiar characteristics of the type to which they belong. I know scarcely any genus in which more false species have been founded on imperfect specimens than *Polysiphonia*:—and this is saying much in the present day, in which the practice has been so largely indulged in, in almost every department of botany;—but especially among cellular plants.

The dichotomous fibres which terminate the branches of our *P. fibrata*, and which have given it its name, are by no means peculiar to it; but are equally characteristic of the young state of most, if not all, the species of the genus. On some they are found more abundant and more fully developed than on others, and in the present plant this is remarkably the case. It is to these fibres the *antheridia* are attached, which on *P. fibrata* are frequently in great abundance, crowning every branchlet with a tuft of golden fruit.

Fig. 1. Tuft of POLYSIPHONIA FIBRATA:—*the natural size.* 2. A branch bearing antheridia. 3. Apical fibres and antheridia. 4. A ramulus with imbedded tetraspores. 5. Tetraspore. 6. Ramuli with ceramidia. 7. A ceramidium. 8. Transverse section of the frond. 9. Articulations from the lower part of the stem: 10, from the middle: 11, from the upper part:—*all more or less magnified.*

W. H. H. del. et lith.

Reeve & Nichols, imp.

PLATE CCCXX.

POLYSIPHONIA SPINULOSA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *spinulosa*; "dark red; branches divaricate, somewhat rigid, the ramuli short, straight, subulate, divaricate; articulations about equal in length and breadth, three-tubed; tubercles" (young ceramidia) "globose, sessile, excessively minute." *Grev. l. c.*

POLYSIPHONIA spinulosa, *Grev. Scot. Crypt. Fl.* t. 90. *Harv. in Hook. Br. Fl.* vol. ii. p. 330. *Harv. Man.* ed. 2. p. 84.

HAB. "Sea-shores" (probably in tide-pools) at Appin, *Captain Carmichael*. Very rare.

GEOGR. DISTR. ——?

DESCR. "*Frond* 1–2 inches in length, of a dark red colour, much branched, with a rigid and spinulose habit; main branches rather remote, irregular, much divaricated, somewhat flexuous; ultimate ramuli straight, subulate, almost thorn-like, divaricated like the rest, sometimes minutely divided at the apex, and each of the divisions terminated in a long, hyaline, jointed filament. *Articulations* about as long as broad, striated with three internal tubes of a pale brown-pink under the microscope. *Tubercles* very minute, quite sessile, round, dark red, scattered freely on the branches, and containing several dark granules."—*Grev. l. c.* A transverse section of the stem (fig. 5) shows four primary siphons of large size, with secondary and tertiary cells at the angles. In drying, the plant adheres to paper.

One of our rarest species, only found by Captain Carmichael, and by him only once, and now figured from a specimen preserved in the Hookerian Herbarium. The resemblance between *P. spinulosa* and our *P. Carmichaeliana* is great, but *P. spinulosa* is a much smaller and more delicate plant, and its stems are articulated throughout.

I have copied Dr. Greville's specific character and description, and refer to his excellent figure in the 'Scot. Crypt. Flora.' The "tubercles" above described are evidently young ceramidia; the specimen having been collected just as they were putting forth. It is obvious from an inspection of the figure that they are metamorphosed ramuli, occupying exactly the position of ramuli. They are profusely scattered over all the branches of the specimen I examined.

Fig. 1. POLYSIPHONIA SPINULOSA:—*the natural size.* 2. A branch. 3. A small branch and ramuli, with apical fibres and young ceramidia. 4. Cross section of one of the smaller branches. 5. Cross section of the stem:—*all more or less highly magnified.*

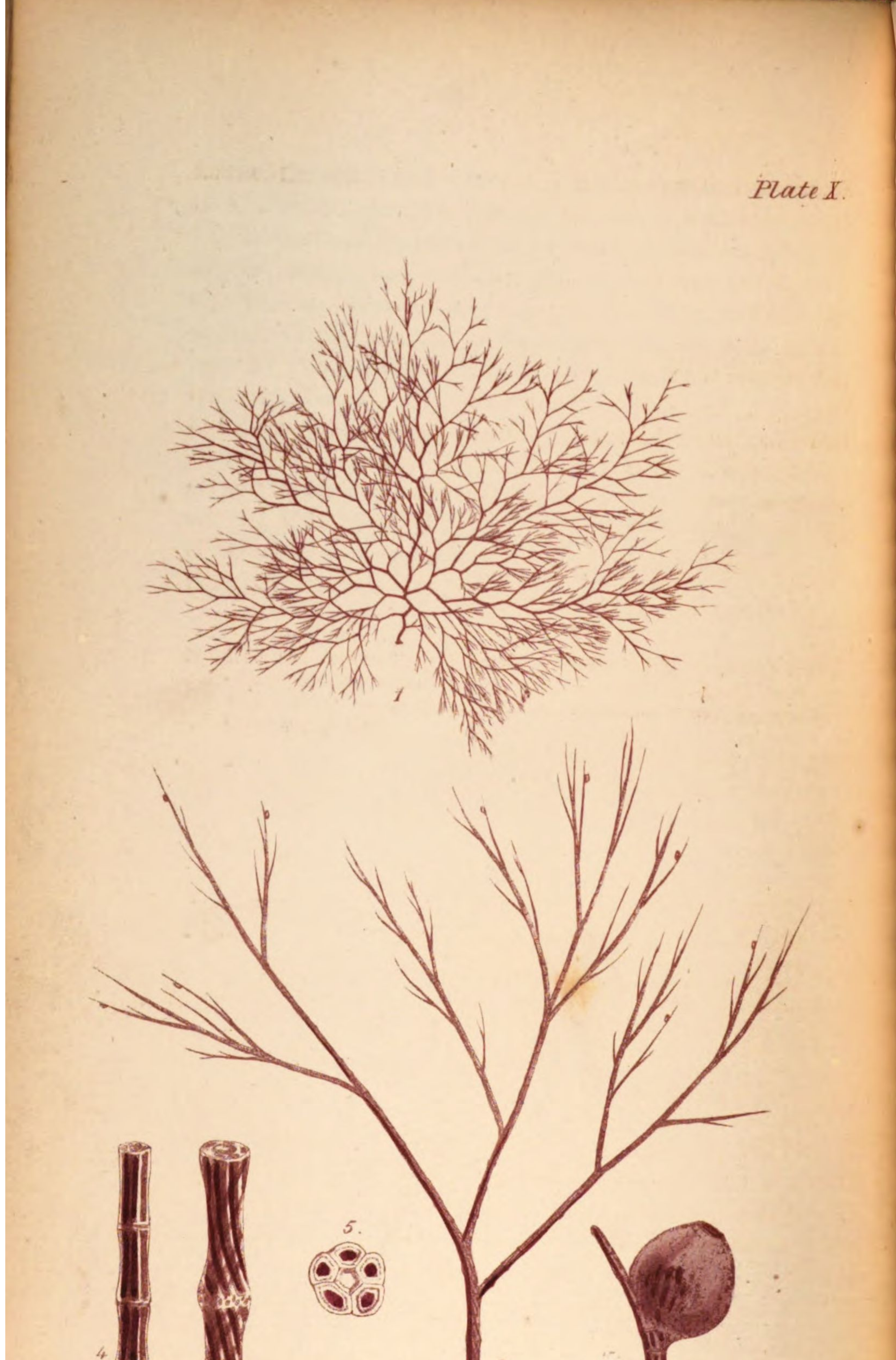

1
4
3
5.
2.
6.

PLATE X.

POLYSIPHONIA RICHARDSONI, *Hook.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed internally of parallel tubes or elongated cellules. *Fructification* two-fold, on distinct plants; 1, ovate capsules (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped seeds; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA—from πολὺς, *many*, and σίφων, a *tube*; because the axis of the frond is composed of many tubes.

POLYSIPHONIA *Richardsoni*; stems cartilaginous, setaceous; branches alternate, elongated, divaricate, beset in the upper part with very patent, straight, sub-dichotomous ramuli; articulations of the stem and branches two or three times longer than broad, irregularly veined; of the ramuli shorter; capsules sessile, globose.

POLYSIPHONIA Richardsoni, *Hook. Br. Fl.* vol. ii. p. 33. *Harv. Man.* p. 90.

HAB. Very rare. At Colvend, Dumfries, *Dr. John Richardson*.

GEOGR. DISTR. South-west of Scotland.

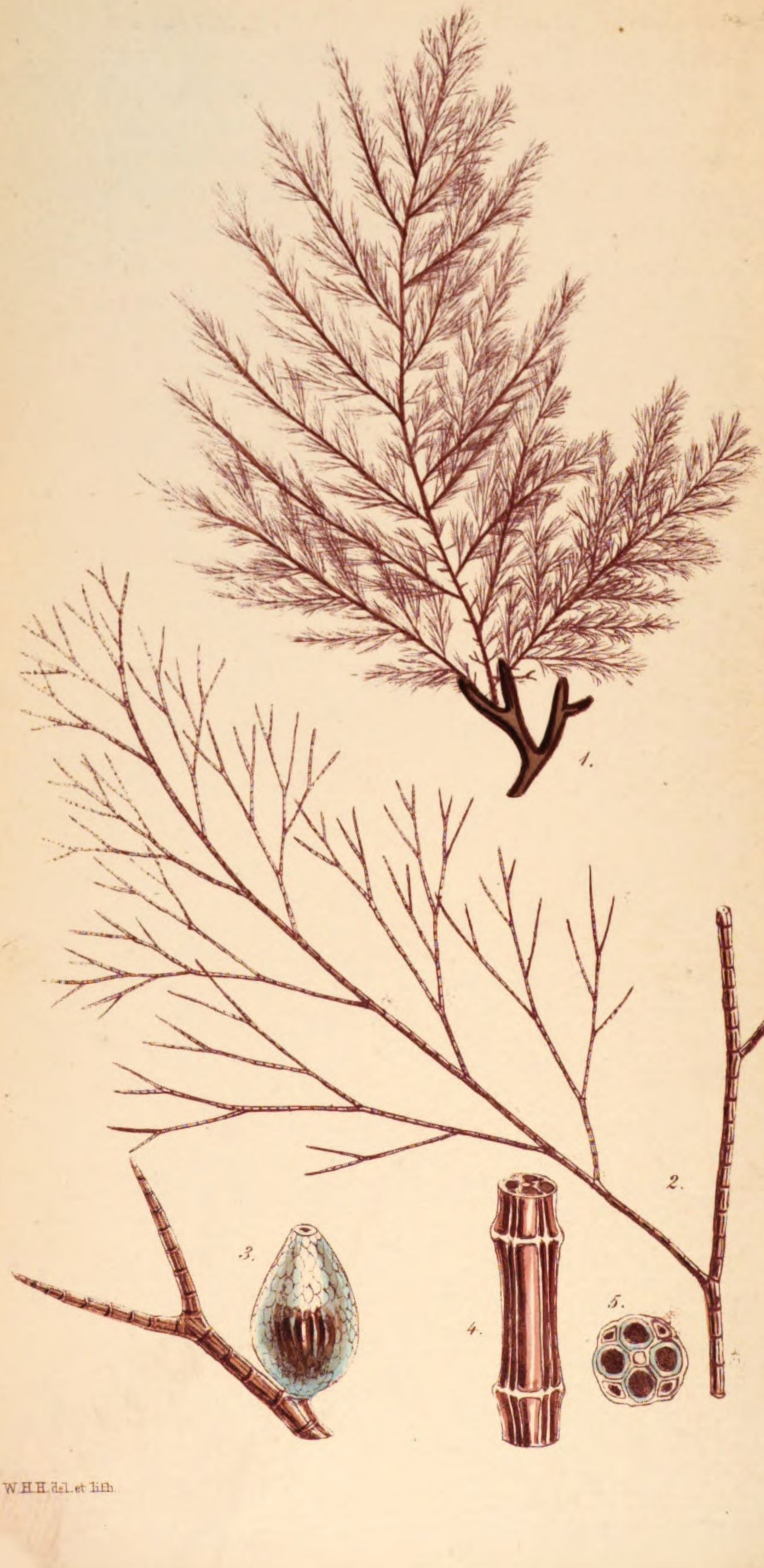
DESC. *Root* scutate. *Frond* 3–4 inches long, setaceous, rather rigid, with a subdistinct, zig-zag stem, very much branched from a short distance above the base; the branches issuing at right angles, angularly bent, as long as the main stem, subquadrifarious, mostly alternate, beset with distant, very patent, subdichotomous, straight branchlets, which bear a few mostly simple, erecto-patent or erect, subulate ramuli. *Articulations* visible in the main stem, subtorulose, the lower ones three or four times longer than broad, spirally or irregularly tubed; the upper shorter, with parallel tubes. Capsules globose, sessile, wide-mouthed, situate near the summits of the lesser branches. Tubes about five in the stem, each with a deep-coloured bag of endochrome.

What little is known of this species, if it be entitled to that rank, is taken from a specimen gathered by Dr. Richardson many years ago, before the Arctic Expedition which he accompanied, and preserved in Sir W. J. Hooker's rich Herbarium. Our uppermost figure is nearly a fac-simile of that specimen.

Though it closely borders in its microscopic characters on several species, its habit does not precisely agree with any with which I am acquainted. The nearest in affinity is perhaps *P. fibrillosa*, and it is possible that it may be only an anomalous

form of that very variable species, from the normal state of which its clearly articulate stem affords a ready distinctive character. The habit of branching strikingly reminds us of *P. elongella*, but in no other character does it agree with that species. There is also an affinity with *P. violacea* and *P. fibrata*, and especially with *P. Griffithsiana*; but from all these it differs in more or less degree, and with none, except the last, has it a very strong relation. With the view of attracting the attention of collectors to the subject, and thereby clearing up the doubts which I cannot help entertaining respecting the validity of the species, I have given it an early figure. Nothing is known respecting the manner or place of its growth, but very probably it is a parasite on some of the smaller Algæ; and most likely an annual, and found in the summer season.

Fig. 1. POLYSIPHONIA RICHARDSONI:—*natural size.* 2. Apex of a branch:—*magnified.* 3. Portion of the stem. 4. Portion of an upper branch. 5. Transverse section of the stem. 6. Capsule or *ceramidium*:—*all more or less magnified.*



W.H.H. del. et lith.

R,B & R, imp.

PLATE CCXXVIII.

POLYSIPHONIA GRIFFITHSIANA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a mass of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *Griffithsiana*; stem rigid, attenuated, alternately branched; branches long, patent, subsimple, furnished with numerous subdichotomous or alternately divided, slender, patent, flaccid ramuli; articulations of the stem, branches, and ramuli about once and a half or rarely twice as long as broad, with straight tubes; siphons in the stem four, with four alternate secondary ones; capsules broadly ovate, sessile.

POLYSIPHONIA Griffithsiana, *Harv. Man.* p. 91.

HAB. On the smaller Algæ between tide-marks. Annual. September. Parasitical on *Polyides rotundus* at Torquay, *Mrs. Griffiths*. Isle of Portland, *Miss White*.

GEOGR. DISTR. South coast of England.

DESCR. *Root* a small disc. *Fronds* laxly tufted, four to five inches long, and nearly as much in expansion. *Stem* undivided, set throughout its length with alternate, spreading branches, the lowest of which are longest, the rest gradually shorter upwards, giving the whole frond a pyramidal outline. *Branches* like the stem, beset with a second and third series of alternate lesser branches, the last of which are more or less furnished with dichotomous, flaccid, slender ramuli. All parts of the frond are conspicuously jointed; the articulations of the stem are from one and a half to twice as long as broad, marked with about five tubes, two of which are much narrower than the rest; those of the branches are about once and a half as long as broad, with two tubes only. A transverse section of the stem shows four primary and four secondary tubes. *Ceramidia* ovate, sessile, scattered on the ramuli. *Colour* a full red, inclining to brownish in drying but not much altered by fresh water. *Substance* rather rigid in the stem and branches, flaccid in the ramuli.

An elegant plant with a good deal the habit of small specimens of *P. violacea*, but known at once from that species by the distinctly jointed stem marked by straight tubes. It moreover resists the action of fresh water for a longer time, and the colour is also different. Some specimens of *P. elongella* have a slight look of

our plant, but usually their peculiar ramification sufficiently marks these species.

P. Griffithsiana was discovered by Mrs. Griffiths in 1837, and has not since been found at Torquay. But I have had the satisfaction of receiving a specimen from Miss White from the Isle of Portland, agreeing in all essential characters with the Torquay plant. I have not compared either with continental specimens, and possibly this plant may be found under some other name in the works of continental botanists. As far as we yet know, however, it is confined to the south shores of England.

Fig. 1. POLYSIPHONIA GRIFFITHSIANA :—*of the natural size.* 2. One of the secondary branches and portion of a primary branch. 3. *Ceramidium* attached to a ramulus. 4. Joints from the stem. 5. Transverse section of the stem :—*all more or less magnified.*

W.H.H. del. et lith.

Reeve, imp.

PLATE CXLVI.

POLYSIPHONIA ELONGELLA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a mass of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), — from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *elongella*; filaments setaceous and rigid below, gradually attenuated upwards, irregularly dichotomous, with very patent axils; upper branches flaccid, more or less furnished with lateral, pencilled, multifid, rose or blood-red ramuli; articulations of the branches about as long as broad, those of the ramuli rather longer, both marked with 2–3 broad, parallel, oblong cells; primary tubes four, surrounding a minute cavity, and encompassed with an external coat of small cells; capsules ovate, on a short stalk; dissepiments pellucid.

POLYSIPHONIA elongella, *Harv. in Hook. Br. Fl.* vol. ii. p. 334. *Harv. Man.* p. 96. *Wyatt, Alg. Damn.* no. 84. *J. Ag. Alg. Medit.* p. 135. *Endl. 3rd Suppl.* p. 45. (n. 30).

HAB. On rocks and stones, and on the smaller Algæ, near low-water mark and at a greater depth. Biennial. Spring and Summer. Rather rare. Sidmouth and Torbay, *Mrs. Griffiths* and *Miss Cutler*. Devonport, *Rev. W. S. Hore*. Jersey, *Miss. H. M. White*. Orkney, *Rev. J. H. Pollexfen*. Ardrossan, *Rev. D. Landsborough*. Dublin Bay, *Miss Ball*. Howth, *Miss. Gower*. Killiney, *Mrs. Apjohn*. Belfast Bay, *Dr. Drummond* and *Mr. Thompson*. Larne, *Mr. D. Moore*. Malahide, *Mr. M'Calla*.

GEOGR. DISTR. Coast of France, *Lenormand*. Adriatic Sea, *J. Agardh*.

DESCR. *Fronds* from two to four or five inches high, solitary or slightly tufted, as thick as hogs' bristle below, cartilaginous and firm, gradually attenuated and becoming flaccid and tender upwards, divaricately or very patently branched, more or less regularly dichotomous, the axils, especially the lower ones, very wide and obtuse. Upper branches elongate, flexuous, alternately divided, and furnished with lateral, multifid, pencilled ramuli, which are more or less dense on different specimens. These ramuli are excessively tender and flaccid, and of a more or less intense sanguineous-red: late in the season they fall away, leaving naked spine-like branchlets. *Articulations* clearly visible in all parts of the frond, the dissepiments being pellucid; lower articulations shorter than their breadth, those of the branches about equal in length and breadth, those of the ramuli rather longer, but rapidly diminishing toward the apices. A transverse section of the lower part of the stem shows four large *primary* tubes, arranged in a cruciform manner round a minute central cavity, and surrounded by two or three rows of cells, gradually smaller outwards; a section of a branch has four similar primary

tubes, surrounded by a very narrow coating of cells. *Capsules* large, ovate, on short slender stalks. *Tetraspores* immersed in the ramuli. *Colour* of the stem dark red, of the ramuli vivid. The upper branches adhere closely to paper in drying, the lower part of the frond very imperfectly.

The winter and summer aspects of a deciduous tree are not more different from each other than are specimens of this beautiful plant collected at opposite seasons. Our figure represents it when in perfection, as it is in spring and in the early months of summer, when its branches are clothed with abundant pencils of delicate rosy or blood-red ramuli. At a later period of the year these fall away, and the specimens collected in September or October are usually quite bare, the larger branches only remaining; and these in their nakedness and rigidity, with broken points and spine-like divaricating branches, have little resemblance to the plant of summer. Such specimens as survive the winter throw out with returning spring fresh pencils of branchlets, even in greater profusion than the first year. Such is also the case with *P. elongata*, which our *P. elongella* strongly resembles in miniature, but from which it may readily be known by the pellucid articulations visible in all parts of the plant, and by the ramuli not tapering to the base. Robust specimens of *P. variegata* have a habit very similiar to the present species, but may always be distinguished to the eye by their purple colour, and under the microscope, by the different structure of the joints which in *P. elongella* have but four principal tubes; in *P. variegata* six, or sometimes seven.

P. elongella is one of the many species the discovery of which is due to Mrs. Griffiths, from whose specimens it was described in the British Flora in 1832. Since that period it has been detected on several parts of our coasts, as well as on the Atlantic coast of France, and in the Adriatic Sea. Its nearest affinity is, perhaps, with *P. breviarticulata*, a Mediterranean species.

Mr. Pollexfen's specimen from Orkney, differs from the usual form in being more distichous, and less zigzag in its branching; but as there is no character in its joints to distinguish it further, I am disposed to regard it as a local variety.

Fig. 1. POLYSIPHONIA ELONGELLA:—*of the natural size.* 2. Branchlet with tetraspores. 3. Apex of the same. 4. Branchlet with capsules. 5. A capsule. 6. Portion of the stem. 7. Transverse section of a branch. 8. Similar section of the stem:—*all more or less magnified,*

W. H. H. del et lith.

F. Reeve, imp.

PLATE CCXCII.

POLYSIPHONIA ELONGATA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *elongata*; stems robust, cartilaginous (rarely gelatinous), irregularly branched, beset, especially towards the tips, with slender, close-set, multifid ramuli, which are attenuate to the base and apex; articulations about as long as broad (the upper ones rarely once and half to twice as long), those of the stem reticulated with veins and more or less obsolete.

POLYSIPHONIA elongata, *Harv. in Hook. Br. Fl.* vol. ii. p. 333. *Wyatt, Alg. Danm.* no. 40. *Harv. in Mack. Fl. Hib.* part 3. p. 209. *Harv. Man.* ed. 2. p. 86. *J. Ag. Alg.* p. 136. *Endl. 3rd Suppl.* p. 45. *Kütz. Phyc. Gen.* p. 428. *Sp. Alg.* p. 828.

POLYSIPHONIA Ruchingeri, *J. Ag.! Alg. Medit.* p. 136. *Kg.! Phyc. Gen.* p. 428. *Kg.! Syst. Alg.* p. 829.

POLYSIPHONIA rosea, *Grev.! Fl. Edin.* p.

POLYSIPHONIA stenocarpa, *Kg. Sp. Alg.* p. 830. *(fide sp. a Zanard.)*

POLYSIPHONIA chalarophlæa, *Kg.! Sp. Alg.* p. 831.

POLYSIPHONIA clavigera, *Kg. Sp. Alg.* p. 831. *(fide sp. a Zanard.)*

HUTCHINSIA elongata, *Ag. Syn.* p. 54. *Hook. Scot.* part 2. p. 87. *Ag. Syst.* p. 152.

HUTCHINSIA Ruchingeri, *Ag. Sp. Alg.* vol. ii. p. 86.

CERAMIUM elongatum, *Roth, Cat. Bot.* vol. iii. p. 128. *Ag. Disp.* p. 19. *Lyngb. Hyd. Dan.* p. 117. t. 66. D. 1. *Grev. Fl. Edin.* p. 310.

CERAMIUM brachygonium, *Lyngb. Hyd. Dan.* p. 118. t. 36.

CONFERVA elongata, *Huds. Fl. Angl.* vol. ii. p. 599. *Dillw. Conf.* t. 33. and suppl. t. G. *E. Bot.* t. 2429.

HAB. Common on stones and shells, in pools between tide-marks, and attached to oyster and scallop shells, &c., in 5–10 fathoms water. Perennial, or at least biennial. Spring and summer.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. North America.

DESCR. *Root* a small disc. *Fronds* solitary, or a few together, but scarcely tufted, from six to twelve inches high, robust, varying in diameter from the thickness of hog's bristle to that of the antenna of a lobster, rising with an un-

divided stem for an inch or two, then much branched and bushy. *Branches* long, sometimes rod-like and scarcely divided, sometimes repeatedly dichotomous or alternately branched; at other times fasciculate or very irregular in division;—now nearly or quite destitute of ramuli, again densely clothed with them, always attenuated at the base, just at the insertion, and tapering at the apex to a fine point. *Ramuli* narrow-spindle-shaped, tapering much to the base and apex, and ending in short fibrils, scattered or crowded, from a quarter to half an inch long or more, not abundant the first season, but very luxuriant in plants of the second year, always softer and of more intense colour than other parts of the frond. *Articulations* of the stem and branches more or less opake, but generally visible, coated with small, sinuous cells, shorter than their diameter; those of the tips of the branches and ramuli more transparent, as long, or once and half, sometimes twice as long, as broad, marked with more parallel tubes, and having transparent dissepiments. *Capsules* ovate, sessile or slightly stalked. *Tetraspores* large, contained in swollen and distorted ramuli. *Substance* of the stem cartilaginous and stiff,—of the ramuli very soft and gelatinous:—in some deep-water varieties (*P. rosea*) the whole plant is flaccid and gelatinous. *Colour* of the ramuli a fine crimson-lake, of the stem and branches dark red or brown.

For remarks, see the following Plate.

Fig. 1. POLYSIPHONIA ELONGATA, plant of the first year:—*the natural size.* 2. Branchlets of the same. 3. Apex of a branchlet. 4. Portion of the stem. 5. Cross section of the stem. 6. Ceramidia and spores:—*magnified.*

W.H.H. del et lith.

F. Reeve imp.

PLATE CCXCIII.

POLYSIPHONIA ELONGATA, *Grev.*

(*For description, see last page.*)

In last plate we have figured the ordinary form of *P. elongata* (*Lobster-horns*) in plants of the first season; and our present plate represents a plant of the second year's growth. In winter the tips of the branches and ramuli of the first year fall away, leaving a stunted and broken frond, very unsightly and often distorted: this constitutes *Ceramium brachygonium* of Lyngbye. Early in spring, new growth commences;—the broken branches put forth vigorous shoots, ending in broad pencils of crimson ramuli, which in a short time clothe the whole upper part of the frond in the rich costume which we have endeavoured here to portray. These different aspects of the species are puzzling to a young observer, who is apt to take a plant of the second year for a different species;—but were these the only difficulties connected with *P. elongata*, a little practice would soon enable the young botanist to surmount them:—for similar changes from winter to summer occur in many other Algæ, as *Rhodomela subfusca*, *Desmarestia aculeata*, &c., and are no other than what continually pass under our eye in the case of land plants whose leaves are deciduous.

But unfortunately, *P. elongata* varies in other respects, as may be inferred from the several synonyms which I have enumerated, a list that would probably be extended had I the advantage of consulting authentic specimens of several other reputed species. The form called *P. Ruchingeri*, originally found in the Adriatic, is common enough on our coast, and differs from ordinary *P. elongata* in being much more slender, of less cartilaginous substance, and especially in having longer articulations. I have examined authentic specimens communicated by Prof. J. Agardh,

and failed to detect any character which may not be found more or less strongly marked in some specimens of *P. elongata*, so that these two forms are easily traced into one. Of the three species quoted from Kützing, I have only seen one authentically named; the other two were communicated by M. Zanardini, on whose authority my specimens rest. Judging by the specimens I have examined, as well as by the descriptions given by Kützing, I have no hesitation in referring them to *P. elongata*; and probably several other species described by Kützing in the same section might also be added without impropriety.

Dr. Greville's *P. rosea* has much more the aspect of a distinct species than any of those already alluded to. It seems confined to deep water, and is much more flaccid than ordinary *P. elongata*, almost gelatinous, closely adhering to paper in every part, and of a brilliant rosy crimson colour. It was first found by Sir John Richardson among rejectamenta in the Frith of Forth, and has been more recently dredged near Carrickfergus by the late Mr. M'Calla, from whom I have excellent specimens.

I should mention another plant recently found in Cork Harbour by Lady Louisa Tenison, which seems almost intermediate between *P. elongata* and *P. elongella*, but different from both. At present I hold it over for future determination. *P. Grevillii*, Harv., appears, from a recent analysis, to be nothing more than *P. violacea*, of a brighter red colour than usual.

Fig. 1. POLYSIPHONIA ELONGATA, a plant of the second year:—*the natural size*. 1. Ramulus with ceramidia. 3. Portion of one of the smaller branches. 4. Transverse section of the same. 5. Ramuli with *tetraspores*:—*all magnified*.

W. H. H. del et lith.

Reeve, Benham & Reeve, imp.

PLATE CCIX.

POLYSIPHONIA VIOLACEA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*) — from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *violacea*; brownish red or purple; stem inarticulate, marked with irregular cells, rather robust, alternately branched; branches quadrifarious, decomposed, bushy or feathery, the ultimate ramuli exceedingly slender, alternately multifid, fibrilliferous; articulations of the ramuli bi-striate, two to four times longer than broad; siphons four; capsules ovate, pedicellate or sessile; tetraspores in swollen, sub-moniliform ramuli.

POLYSIPHONIA violacea, *Grev.*—*Wyatt, Alg. Danm.* no. 176. *Harv. Man.* p. 92 (*not of Harv. in Brit. Fl.* vol. ii. p. 332). *Kütz. Phyc. Gen.* p. 421. (no. 34) and p. 426 (no. 74). *Endl. 3rd Suppl.* p. 46.

HUTCHINSIA violacea, *Ag. Syn.* p. 54. *Lyngb. Hyd. Dan.* p. 112. t. 35 (*quoad partem*) f. B. *Ag. Syst.* p. 150. *Ag. Sp. Alg.* vol. ii. p. 76.

HAB. On rocks and stones, and on the smaller Algæ, near low water mark. Annual. May and June. Not uncommon. Torbay, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Falmouth Harbour, *Miss Warren*. Most abundant at Carnarvon, *Mr. Ralfs*. Beggar's Island, Plymouth, *Mr. Rohloff*. Belfast Lough, *Dr. Drummond*. Roundstone, *Mr. M'Calla*. Howth, *Miss Gower*. Ferriter's Cove, Kerry, *Mr. Andrews*.

GEOGR. DISTR. Shores of Northern Europe generally.

DESCR. *Root*, a small disc. *Fronds* from six to ten inches long or more, with a principal stem which varies in diameter from the thickness of a hog's bristle to twice that thickness, and is divided in an irregularly alternate manner. *Branches* quadrifarious, repeatedly compounded, till there results a bushy or feathery, closely branched frond, each division of which becomes more and more slender and flaccid, and the whole at length terminates in an abundance of slender capillary ramuli, which are long and subsimple, sparingly branched near the top, and generally terminated by a tuft of byssoid fibres. *Stem* and principal branches inarticulate, their siphons being coated externally with a thick stratum of irregular cells. *Ramuli* articulate; the articulations two-tubed, the lower ones four times, the upper twice as long as broad. *Ceramidia* ovate, abundant on the ramuli, frequently pedunculate. *Tetraspores* imbedded in swollen ramuli, roundish. *Colour*, brown red, more or less purple, and frequently assuming a fine

purple shade on drying, after immersion in fresh water. *Substance* very tender and soft, cartilaginous in the stem and branches, gelatinous in the ramuli, closely adhering to paper.

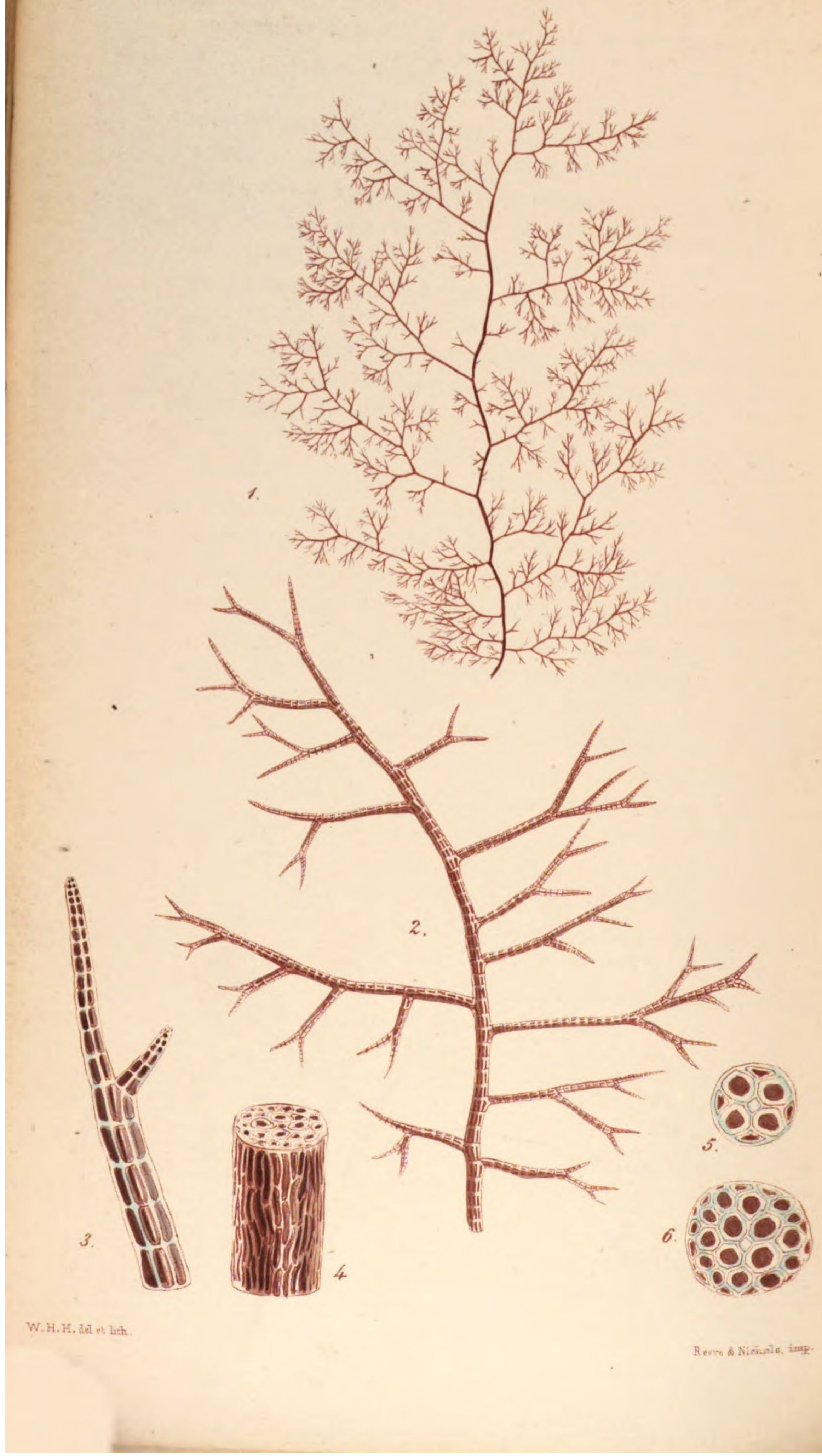
A very beautiful species, in many respects resembling *P. fibrata*, especially in the appearance that small portions present to the microscope; but this is a much larger and finer growing plant, and readily and clearly distinguished by the opake stem, coated with short, irregular cells. In some specimens the byssoid ramuli are much developed, and of a beautiful violet colour, especially when dried; in others they are far shorter, and the frond has a more bushy appearance. In a young state the tips are found clothed with fibres, but these are rarely seen in the more advanced stages of growth.

From *P. Brodiæi*, to which luxuriant specimens bear much resemblance, *P. violacea* is at once known by the fewer number of tubes in the stem; the siphons in that species being seven in number, whereas in this there are but four.

The species called *P. violacea* in the British Flora, on the authority of Carmichael, is very different from the present; but so near *P. nigrescens* in its essential characters that I am now disposed to regard it as merely a variety of that species. I had at one time kept it distinct under the name of *purpurascens*. Every one acquainted with *P. nigrescens* must know that it puts on a great variety of shapes, and the state formerly called *violacea* differs from the usual forms in being of a brighter and more purple colour, with greater delicacy of ramification.

Our present *P. violacea* was first detected as British by Mrs. Griffiths, and ascertained to be identical with the plant of continental authors by Professor J. Agardh, who inspected the specimens published in the early copies of Mrs. Wyatt's books. It has been found on most of our coasts, and is probably distributed round the shores of the British Isles.

Fig. 1. POLYSIPHONIA VIOLACEA:—*the natural size.* 2. Ramuli with *tetraspores.* 3. Ramulus removed. 4. A tetraspore. 5. Fibrilliferous apex. 6. Ramuli with *capsules.* 7. A capsule. 8. Portion of the stem, to show its surface cells. 9. Transverse section of the stem, to show the siphons.



W. H. H. del et lith.

Reeve & Nicholls, imp.

Plate CCCXIX.

POLYSIPHONIA CARMICHAELIANA, *Harv.*

Gen. Char. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. Polysiphonia (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

Polysiphonia *Carmichaeliana*; stem inarticulate, percurrent, flexuous, rigid, set throughout with lateral, alternate, inarticulate, divaricating branches; ramuli scattered, very patent, irregularly forked, articulate; articulations as long as broad, three-tubed.

Polysiphonia Carmichaeliana, *Harv. in Hook. Br. Fl.* vol. ii. p. 328. *Harv. Man.* ed. 2. p. 87.

Polysiphonia divaricata, *Carm. MS.* (*not of Agardh*).

Hab. Parasitical on *Desmarestia aculeata*. Appin, *Capt. Carmichael*. Very rare.

Geogr. Distr. (Not known elsewhere.)

Descr. *Filaments* tufted, but not densely so, about four inches high, rigid, thicker than hog's bristles; *stem* undivided, running through the frond, bent alternately from side to side in a slightly angular manner, inarticulate, furnished throughout with lateral branches. *Branches* widely spreading and divaricating, bent like the stem, and furnished with very patent or horizontal lesser branches, which in their turn bear numerous scattered irregularly-forked ramuli, standing at right angles to the branch from which they grow. The whole aspect of the plant is thorny and irregular, and the substance rigid. The small branches and ramuli are alone articulated; their articulations are about as long as broad, and three-tubed; and a transverse section shows four large primary siphons with external secondary cells at the angles. *Fruit* unknown. *Colour* a dark brown-red, changing to black in drying, in which state the plant adheres very imperfectly to paper.

I here figure a specimen collected by Capt. Carmichael, at Appin, and now preserved in the rich Herbarium of Sir W. J. Hooker. No one but Carmichael has met with this plant, to my knowledge, and he only found it once. Its characters are

so peculiar that I formerly considered myself justified in assigning it a specific name. How far I acted wisely may be questioned. At any rate, as it has borne a name in British works for many years, it is right that it should now be figured, that persons visiting the western shores of Scotland may look out for it. Rigid and spiny as it looks, I have sometimes thought that it may be only an extravagant form of *Pol. fibrillosa*.

Fig. 1. POLYSIPHONIA CARMICHAELIANA:—*the natural size.* 2. A portion of a secondary branch with ramuli. 3. Apex of a ramulus. 4. Portion of the stem. 5. Cross section of a small branch. 6. Cross section of the stem:—*all more or less magnified.*

W. H. H. del et lith.

F. Reeve, imp.

PLATE CCCII.

POLYSIPHONIA FIBRILLOSA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; articulations longitudinally striate, composed of numerous, radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *fibrillosa*; pale straw-colour or brownish; stems inarticulate, opake, with sinuous veins, robust, alternately branched; branches spreading, resembling the stem, but less opake, articulated towards the apices, subsimple, thickly set with very slender, articulated, finely divided, short ramuli, whose tips are copiously fibrilliferous; articulations of the ramuli rather longer than broad, 2–3-striate; siphons four, in the stem surrounded by a thick wall of small cells; capsules broadly ovate; tetraspores large, in distorted terminal ramuli.

POLYSIPHONIA fibrillosa, *Grev.—Harv. in Hook. Br. Fl.* vol. ii. p. 334. *Harv. Man.* ed. 2. p. 87. *Wyatt, Alg. Danm.* no. 136. *Endl. 3rd Suppl.* p. 46. *J. Ag. Alg. Medit.* p. 138. *Kütz. Sp. Alg.* p. 827. *Kütz. Phyc. Gen.* p. 427.

HUTCHINSIA fibrillosa, *Ag. Sp. Alg.* vol. ii. p. 78. *Lyngb. Hyd. Dan.* p. 113.

HUTCHINSIA lubrica, *Ag. l. c.* p. 94 *(fide J. Ag.)*

HUTCHINSIA pilosa, *Nacc. (fide J. Ag.)*

CONFERVA fibrillosa, *Dillw.! Syn.* p. 86. t. G.

HAB. On rocks and stones, and on *Algæ*, chiefly in clear, sunny pools left by the falling tide. Annual. Summer. Frequent on the British coasts.

GEOGR. DISTR. Atlantic shores of Europe. Baltic and Mediterranean Seas.

DESCR. *Root* a small disc. *Fronds* solitary or tufted, not densely aggregated, from six to eight or ten inches in length, often twice the diameter of hog's bristle in the lower part, attenuated upwards; sometimes of half these dimensions or less. *Stem* either undivided, running through the frond, or once or twice parted into a few principal branches, naked for a short way above the base, then furnished with closely-placed lateral branches for the whole remaining length. *Branches* widely spreading or horizontal, robust like the stem, the lowermost longest, the rest gradually shorter, repeatedly and decompoundly branched alternately, each younger set of branches more slender than the rest, till the ultimate divisions are finer than hair. In large and old specimens the series of lesser branches are sometimes as many

as six or eight, when the plant becomes exceedingly feathery and delicate. *Stem* and branches opake, without visible articulations, coated with sinuous, narrow veins; lesser branches toward the upper part gradually more clearly jointed, with swollen joints, the articulations once and a half to twice as long as broad; small branches and ramuli all pellucidly articulate, two-tubed, with short joints; their tips copiously clothed with dichotomous fibrils. A cross section of the stem shows four large tubes, surrounding a minute cavity and clothed externally with a broad stratum of cells; all coloured. *Capsules* ovate, scattered over the lesser branches and generally sessile. *Tetraspores* large, imbedded in the ramuli. *Colour*, when growing (as the plant often does) in sunny pools, a pale straw-yellow; when developed in darker places, more or less deeply brown: in drying it becomes always darker and usually of a rich reddish-brown. *Substance* cartilaginous in the stem, very soft and gelatino-membranaceous in the ramuli. It closely adheres to paper in drying, and soon decomposes in fresh water or the air.

A common plant, subject to many variations in form, but generally recognized by its somewhat clumsy, unjointed stems, and short, soft, and gelatinous ramuli copiously fibrillose at the tips. It is most nearly related to *P. violacea*, with which alone can it well be confounded, and from which it chiefly differs in its shorter and less multifid ramuli, duller colour, and shorter articulations; but there are specimens occasionally found which seem almost to connect these two species together.

I have not enumerated the continental *P. allochroa* among the synonyms, not having examined an authentically named specimen of that species; but what I have received from several correspondents under that name does not appear to me to differ essentially from *P. fibrillosa* of British authors.

Fig. 1. POLYSIPHONIA FIBRILLOSA:—*the natural size.* 2. A small branch. 3. Fibril from one of the tips of the same. 4. Branchlets with a capsule. 5. Branchlet with tetraspores. 6. Portion of the lower part of the stem. 7. Transverse section of the same.

W.H.H. del. et lith.

Reeve, Benham & Reeve imp.

PLATE CXCV.

POLYSIPHONIA BRODIÆI, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; the joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* two-fold on different individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *Brodiæi*; stems inarticulate, robust, cartilaginous, alternately branched; branches virgate, clothed with spreading, pencilled, multifid, delicate, flaccid ramuli ; articulations of the ramuli three or four tubed, rather longer than broad; siphons in the stem about seven, surrounding a narrow cavity; capsules ovate, pedicellate, or subsessile; tetraspores in the swollen tips of the multifid ramuli.

POLYSIPHONIA Brodiæi, *Grev.—Harv. in Hook. Br. Fl.* vol. ii. p. 328. *Harv. in Mack. Fl. Hib.* part 3. p. 206. *Wyatt, Alg. Danm.* no. 83. *Harv. Man.* p. 91. *Endl. 3rd Suppl.* p. 45. *Kütz. Phyc. Gen.* p. 427.

HUTCHINSIA Brodiæi, *Lyngb. Hyd. Dan.* p. 109. t. 33. *Hook. Fl. Scot.* part 2. p. 88. *Ag. Syst.* p. 154. *Ag. Sp. Alg.* vol. ii. p. 63.

HUTCHINSIA penicillata, *Ag. Sp. Alg.* vol. ii. p. 65.

CONFERVA Brodiæi, *Dillw. Conf.* t. 107. *E. Bot.* t. 2589.

CERAMIUM Brodiæi, *Ag. Disp.* p. 20.

HAB. On rocks and corallines near low-water mark. Annual. Summer. Common on the rocky shores of Scotland; of the south of England, and south and west of Ireland. Channel Islands.

GEOGR. DISTR. Atlantic shores of Europe, as far south as France; and of North America. Fœroe Islands.

DESCR. *Root* a conical disc. *Fronds* from six to twelve inches long or more, as thick as small twine at the base, gradually attenuated upwards, generally furnished with a more or less evident main stem divided into several long, simple branches, of a linear-lanceolate outline. Sometimes the branches spring from nearly the same points; at other times they are disposed alternately along a lengthened stem, when the frond assumes a pinnate character. *Branches* long and simple, inarticulate like the stem, quadrifarious, and clothed more or less densely with short, flaccid, and slender quadrifarious ramuli, about half an inch in length. *Ramuli* multifid, irregularly dichotomous, pencilled, articulated. *Articulations* of the ramuli rather longer than broad, marked with three or four tubes; dissepiments hyaline. *Stem* opake, traversed by about seven primary siphons, surrounded by as many secondary ones, and with a wide stratum of smaller cells. *Capsules* ovate, abundantly produced on the multifid ramuli, mostly pedicellate. *Tetraspores* in swollen ramuli. *Colour* a dark brown, with more or less of a purplish

shade. *Substance* very soft, in some instances gelatinous, and soon decomposing in fresh water. *Smell* very disagreeable.

This is one of the handsomest, as it is one of the largest of the British species of *Polysiphonia*, and easily recognised, except occasionally from some specimens of *P. fruticulosa*, by its peculiar habit. The inarticulate stem, and long, simple, robust branches clothed with pencils of delicate filaments strongly mark the species. Common as it is now ascertained to be on many of our shores, as well as on those of northern Europe and the eastern shores of North America, it remained unnoticed by botanists until it was observed about forty years ago, by the late Mr. Brodie, of Brodie, to whose honour Mr. Dillwyn has dedicated it.

The figure originally given in Dillwyn's Confervæ is very characteristic of a common form of the plant; and so also, as it appears to me, is that given by Lyngbye, which latter, nevertheless, is held by the elder Agardh to represent a distinct species, which he calls *P. penicillata*. Except in the greater simplicity of ramification, this last perfectly agrees with the common form; and I confess myself unable to draw any distinct line, even sufficient to mark a *variety*, between it and the plant represented in our plate. It would be easy to find, in the large suite of specimens from which I have had to select, several forms distinguished by minor peculiarities of branching, which nevertheless agree in the aggregate of characters; and if *P. penicillata* be admitted to rank as a species, we must be prepared to divide the species still more; but, I think, to little purpose.

Fig. 1. POLYSIPHONIA BRODIÆI:—*of the natural size.* 2. Multifid ramulus, with capsules. 3. Apex of the same, with a capsule. 4. Apex of a ramulus with tetraspores. 5. Transverse section of the stem.

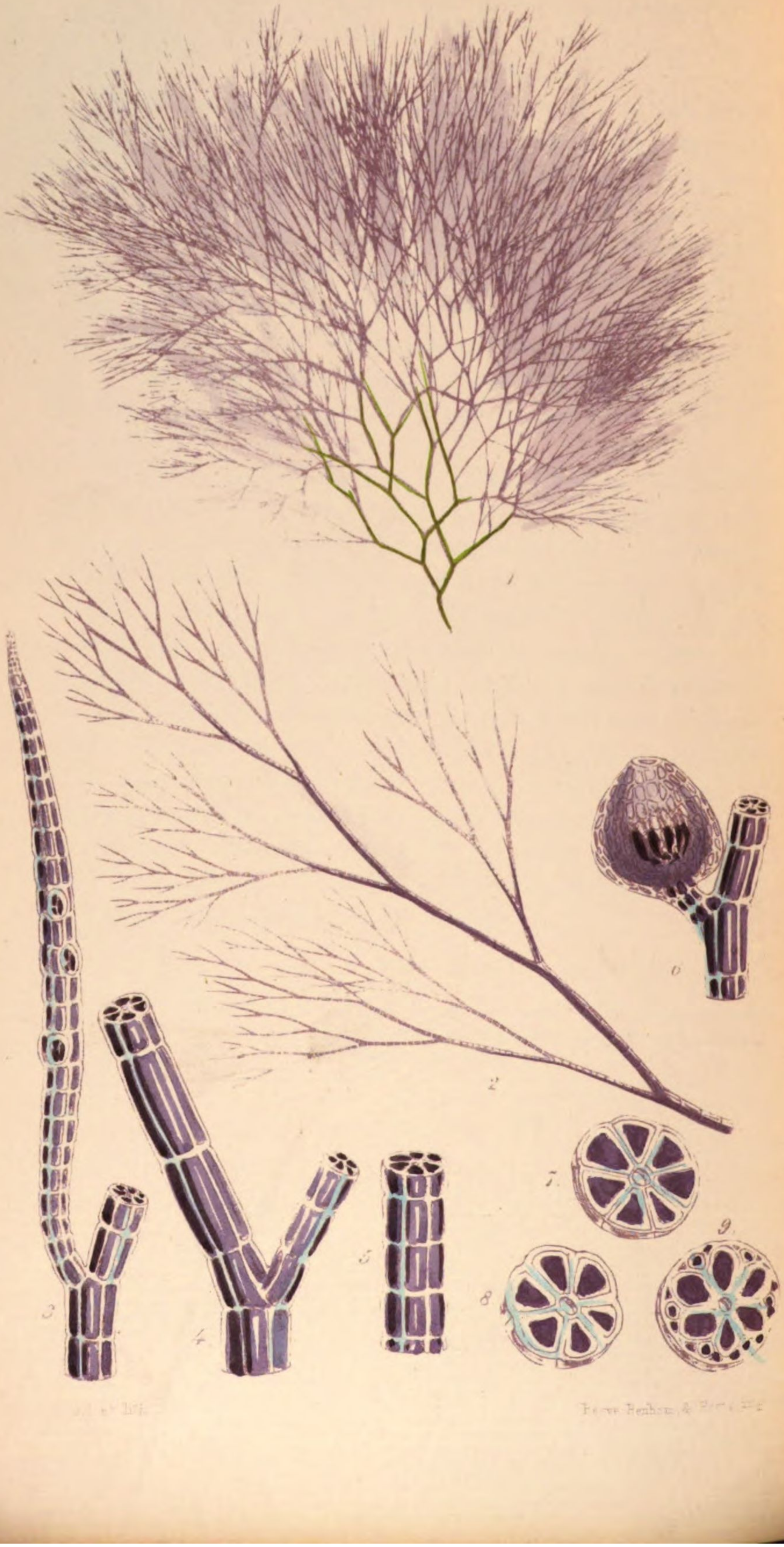

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PLATE CLV.

POLYSIPHONIA VARIEGATA, *Ag.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a mass of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *variegata*; filaments brownish-purple, or greenish, setaceous, and rigid below, gradually attenuated upwards to a capillary fineness, dichotomous, the lower axils very patent; branches somewhat zig-zag, elongated, much divided, set with lateral, capillary and very flaccid, multifid, purple ramuli; articulations near the base shorter than their breadth, twice as long as broad in the principal branches, and gradually becoming shorter upwards, marked with three, broad, parallel, oblong cells, separated by pellucid spaces; tubes six or rarely seven, surrounding a minute cavity; capsules ovate, on a short stalk.

POLYSIPHONIA variegata, *J. Ag. Alg. Medit.* p. 129. *Endl. 3rd Suppl.* p. 45. *Kütz. Phyc. Gen.* p. 424.

POLYSIPHONIA peucedanoides, *Mont. Herb.*

HUTCHINSIA variegata, *Ag. Syst.* p. 153. *Ag. Sp. Alg.* vol. ii. p. 81.

GRAMITA peucedanoides, *Bonnem. Mem. Mus.* 1824.

HAB. On mud-covered rocks in bays and estuaries, also on *Zostera*, *Chorda filum*, floating timber, &c. Annual. Summer and autumn. Very local. St. German's River (1846), *Mr. Rohloff*. Beggar's Island, Trevol, Torpoint, and various other places near Plymouth, *Rev. W. S. Hore* and *Dr. J. Cocks*.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean and Adriatic Seas; very abundant at Venice. West Indies, *Agardh*. Atlantic shores of N. America, *Prof. Bailey*, &c.

DESCR. *Fronds* forming dense tufts, from four to eight or ten inches long, as thick as hog's bristle and somewhat rigid at base, gradually attenuated upwards, and becoming more flaccid until they pass away into a capillary or byssoid fineness. *Filaments* very much branched, dichotomous, the lower axils very patent or divaricating, close together, the upper gradually more distant and less spreading; secondary branches somewhat virgate, zig-zag, set with more or less divided, and more or less dense dichotomous ramuli, whose axils are very acute; ramuli very flaccid and slender. *Articulations* in the lower part of the filament shorter than broad, sometimes opake (in old plants); in the branches once and a half to twice as long as broad; gradually shorter in the ramuli; all of them marked with three broad tubes. A cross section of a branch shows six, or rarely seven, radiant cells; that of an old stem has a more or less complete row of external cellules. *Capsules* broadly ovate, plentiful on the lesser branches and ramuli, shortly stalked. *Tetraspores* small, imbedded in slightly swollen ramuli. *Colour* of the lower part of the stem often greenish, of the upper, and especially of the ramuli, more or less dark-purple. *Substance* rigid below, flaccid and gelatinous above.

It was with much pleasure that I received, in the summer of 1846, from my friend Mr. Rohloff, a specimen of this interesting and beautiful species, which he was so fortunate as to discover in that year; and I have to thank him, as well as my friends Mr. Hore and Dr. Cocks, for a liberal supply of specimens gathered in several localities near Plymouth, in the summer and autumn of 1847. It appears to be an abundant species in that neighbourhood, where it grows in the greatest luxuriance. As yet no other locality in Britain has been recorded, but it will probably hereafter be found in similar situations on the south coast of England, and south and west of Ireland. The favourite locality of this plant seems to be mud-banks, or mud-covered rocks. It requires some algological zeal to hunt over such ground,—which, to many collectors, would appear little likely to yield anything so beautiful; yet such ground is very favourable to the growth of many of this genus, and of the finest *Callithamnia*.

No species need be more distinct than this is. Its habit is very like that of *P. elongella*, it is true, but the purple colour affords an obvious character; while the *six tubes* of the stem furnish an important distinction from that, and all other British species yet known.

P. variegata is widely dispersed through the warmer latitudes of the Atlantic, and abounds on certain parts of the Mediterranean and Adriatic shores. Indeed, where it establishes itself, it generally occurs in quantity. At Venice it is the commonest of the genus; but Venetian specimens are greatly inferior in size and beauty to some of their Plymouth brethren. Those which I have received from Dr. Bailey of New York are nearest to the luxuriance of the latter.

My friend Dr. Montagne contends that the specific name *peucedanoides*, under which this plant was described by Bonnemaison, in the same year that Agardh published it under the name here adopted, should be preferred. It has only this inconvenience, the changing a name now universally known, for one which is little known, and of which the priority, its only recommendation, is disputable. We have no proof that Agardh was acquainted with Bonnemaison's synonyme at the time he published the 'Systema.'

Fig. 1. POLYSIPHONIA VARIEGATA:—*of the natural size.* 2. Apex of a branch, with lateral ramuli. 3. A ramulus. 4. Portion of a branch. 5. Portion of the stem. 7, 8. Sections of branch. 9. Section of old stem:—*all more or less highly magnified.*

1.

2.

3.

4.

5.

6.

W. H. H. del et lith.

R. B. & R. imp.

PLATE CCLXXVIII.

POLYSIPHONIA SIMULANS, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), — from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *simulans*; filaments slender, bushy, branched from the base; branches alternate, patent, repeatedly (but irregularly) pinnate; the penultimate branches long and simple, set with short, distant, spine-like ramuli; articulations of the branches once and half as long as broad, of the ramuli shorter, many-tubed; siphons about twelve; ceramidia globose or ovate.

POLYSIPHONIA simulans, *Harv. Man.* ed. 2. p. 89.

POLYSIPHONIA spinulosa, *Griff. in Harv. Man.* ed. 1. p. 87. (*not of Grev.*)

POLYSIPHONIA divergens, γ Grevilleana, *Kütz. Sp. Alg.* p. 822. (Torquay specimens.)

HAB. On rocks, &c., in tide-pools near low-water mark. Annual? Summer. Rare. Bathing Cove, Torquay and Torabbey Rocks, *Mrs. Griffiths*. Bovisand, *Rev. W. S. Hore*. Jersey, *Miss White* and *Miss Turner*. Valentia, Kerry, *W. H. H.* Skaill, Orkney, *Rev. J. H. Pollexfen*.

GEOGR. DISTR. Not noticed out of Britain.

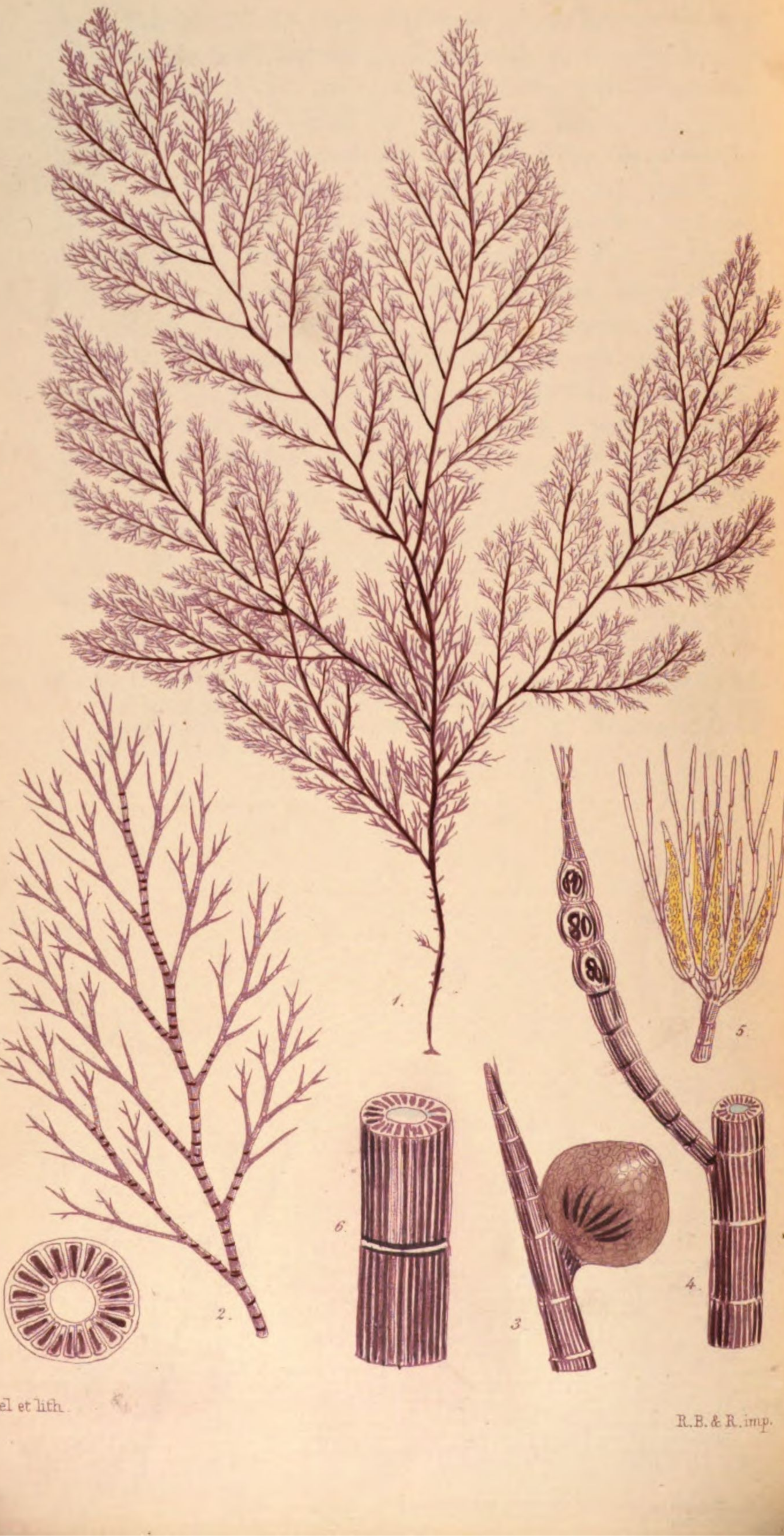
DESCR. *Fronds* densely tufted, two or three inches high, branched from the base and bushy, setaceous below, capillary above, irregularly divided. *Branches* alternate, somewhat pinnate, not perfectly distichous, decompound, the divisions set with short, subulate, scattered, spine-like ramuli, and connected together by irregular spine-like processes, so that the lesser divisions are difficult to spread out. *Articulations* of the stem and branches about once and half as long as broad, of the ramuli very short, with pellucid dissepiments, multistriate; siphons about twelve, surrounding a small central tube. *Ceramidia* ovate, sessile, scattered on the smaller branches. *Tetraspores* immersed in slightly swollen ramuli. *Colour* a dull reddish-brown, or dark brown-red. *Substance* stiff and brittle, becoming flaccid in fresh water, and then adhering to paper.

In the first edition of my "Manual," I fell into an error in confounding this species with *P. spinulosa* of Greville, a plant to

which it bears only an outward resemblance, differing very essentially in microscopic characters. In the original *P. spinulosa* there are but *four* siphons surrounding the central cavity; here there are *twelve*. By comparing the figure now given, with that of *P. subulifera*, it will be seen that there is a much nearer relationship to that species than to any other British one, and except for some differences of habit, and minor differences in structure, the two might perhaps be brought together. Prof. J. Agardh, however, who saw specimens of our *P. simulans* during his visit to England, pronounced them distinct, an opinion also entertained by Mrs. Griffiths, and in which, though not without misgivings, I concur. As it is no longer possible to retain the name *spinulosa* for the plant here figured, I propose that of *simulans*, alluding to its deceptive character;—for it looks sometimes like *P. subulifera*, sometimes like *P. nigrescens*, and has been mistaken, as we have seen, for *P. spinulosa*.

It is one of our rarer species, although found in several distant localities.

Fig. 1. POLYSIPHONIA SIMULANS:—*the natural size.* 2. A small branch. 3. Ceramidium. 4. Ramulus with imbedded tetraspores. 5. Joints from the stem, and young ramulus with apical fibres. 6. Transverse section of the stem:—*all magnified.*



W.H.H. del et lith.

R.B. & R. imp.

Plate CCLXXVII.

POLYSIPHONIA NIGRESCENS, *Grev.*

Gen. Char. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branches. Polysiphonia (*Grev.*), — from πολυς, *many*, and σιφων, a *tube*.

Polysiphonia *nigrescens*; fronds robust, rigid, and generally rough with broken branches below, much branched and bushy above; the branches alternate, repeatedly divided in a pinnate manner; ramuli distant, elongated, awl-shaped, alternate, the upper ones sometimes having a few processes near the tips; lower articulations short, upper rather longer than broad; siphons about twenty, surrounding a large tube; ceramidia broadly ovate, sessile or nearly so.

Polysiphonia nigrescens, *Harv. in Hook. Br. Fl.* vol. ii. p. 332. *Wyatt, Alg. Danm.* no. 135. *Harv. in Mack. Fl. Hib.* part 3. p. 208. *Harv. Man.* ed. 1. p. 88. ed. 2. p. 89. *Endl. 3rd Suppl.* p. 45. *Kütz. Phyc. Un.* p. 421. t. 50. iv. *Sp. Alg.* p. 813.

Polysiphonia fucoides, *Grev. Fl. Edin.* p. 308.

Hutchinsia nigrescens, *Lyngb. Hyd. Dan.* p. 109. t. 33. *Ag. Syst.* p. 151. *Ag. Sp. Alg.* vol. ii. p. 69.

Hutchinsia fucoides, *Hook. Fl. Scot.* part 2. p. 87.

Conferva nigrescens, *Huds. Fl. Ang.* p. 602. (??) *Dillw. Conf.* no. 155. *Eng. Bot.* t. 1717.

Conferva fucoides, *Huds. Fl. Ang.* p. 603. *With.* vol. iv. p. 141. *Dillw. Conf.* t. 75. *Eng. Bot.* t. 1743.

Hab. On rocks, and stones, and attached to Algæ, &c., between tide-marks. Perennial? Summer. Abundant on the British shores.

Geogr. Distr. Atlantic shores of Europe and America. New Zealand.

Descr. *Root* a small, discoid expansion. *Fronds* many from the same base, from three to twelve inches long or more, sometimes very slender and almost capillary, sometimes robust, twice as thick as hog's bristle, simple below, very much branched and bushy above. The ramification, like almost every other character of this variable plant, is subject to many anomalies. In what may be considered the typical form, the stem divides into several principal branches, and the frond when displayed is broadly flabelliform in outline. Each main branch is obovate, and closely pinnated with alternate, erecto-patent secondary branches of similar outline; and these latter are doubly pinnate. The ultimate pinnules are subulate, distantly placed, regularly alternate, rather erect, and either quite simple or having one or

two thorn-like processes near the apex. In other varieties the decompound-pinnate character is less obvious; there is less distinction into a primary stem and branches, and all parts of the frond are more erect, sometimes being very erect. In other specimens the lateral pinnæ are short and nearly simple: and in a singular variety (possibly a species) found by Mrs. Griffiths, at Larderham, Torbay, every division of the plant is patent and divaricate, and the substance stiff and rigid. Late in the season the finer upper ramuli disappear; the frond becomes unsightly and distorted, and rough with the stumps of its broken ramuli. In this state it survives through the winter, and next spring produces a new and copious crop of branches. *Ceramidia* nearly sessile, broadly ovate. *Tetraspores* immersed in the tips of distorted ramuli. *Siphons* about twenty, narrow, surrounding a large cavity. *Colour* purple in the finer branches, very dark, and brownish below, rarely brown-red; darkening and almost blackening in drying. *Substance* in the stem rigid; in the ramuli soft, flaccid, and adhering, but not strongly, to paper.

This species varies considerably in appearance according to the time of year at which the specimens are collected, the autumnal or winter individuals being coarse and bushy, with crowded ramuli, while those gathered in spring and summer are of the feathery character represented in our figure. Some are of a dark purple, and others are of a dull brown, or pale; but all become much darker and even black in drying. From all the British species of the section to which it belongs, *P. nigrescens* may be known by the distantly pinnated ramuli, the very large number of siphons, and the comparatively wide central tube. When bearing antheridia the tips of the branches are yellow.

I am unable to distinguish *P. atropurpurea* from a common form of the species.

Fig. 1. POLYSIPHONIA NIGRESCENS:—*the natural size.* 2. A small branch. 3. Apex of a ramulus with ceramidium. 4. Ramulus with tetraspores. 5. Antheridia. 6. Articulations of the stem. 7. Transverse section of the stem:—*all magnified.*

W.H.H. del et lith.

F. Reeve, imp.

PLATE CCCIII.

POLYSIPHONIA AFFINIS, *Moore*.

GEN. CHAR. *Frond* filamentous, partially or generally articulate; articulations longitudinally striate, composed of numerous, radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *affinis*; filaments robust, elongated, cartilaginous below, flaccid above, irregularly divided; branches patent, naked at base, multifid and with an ovate outline above; ramuli very erect, simple or divided, acute; articulations multistriate, the lower two or three times longer, the upper as long as broad; siphons about sixteen; ceramidia ovate, stalked or subsessile.

POLYSIPHONIA affinis, *Moore in Ord. Surv. Londonderry, Appendix*, p. 11. t. 7. *Harv. Man.* ed. 2. p. 90.

HAB. On rocks, &c., in the sea, thrown up from deep water. Carnlough, near Glenarm, *Dr. Drummond*. Cushendall, *Mr. Moore*. (*W.H.H.*, 1850.)

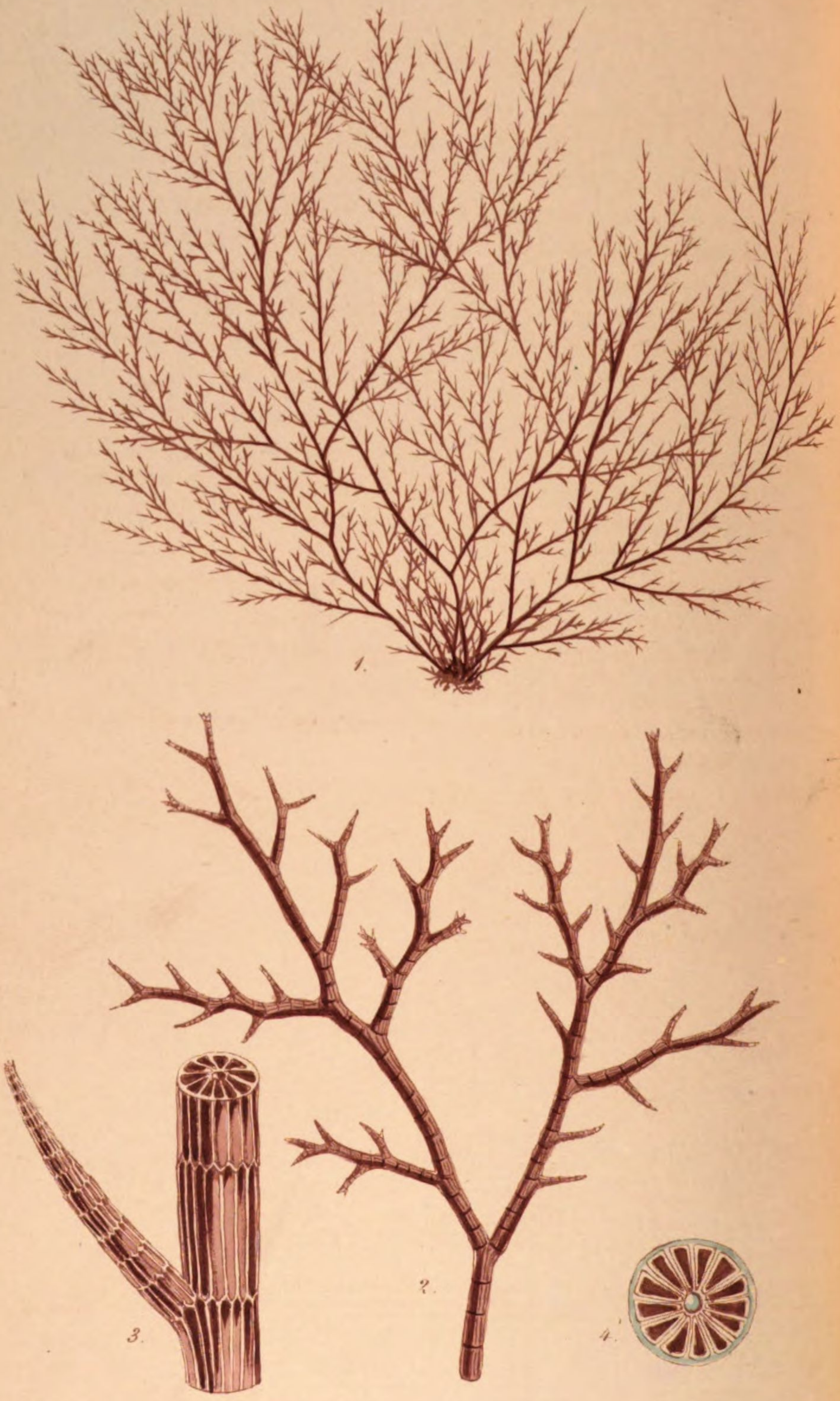
GEOGR. DISTR. —— ?

DESCR. *Root* a small disc. *Fronds* as thick as hog's bristle at base, attenuated upwards, six or eight inches long or more, divided irregularly, or subdichotomously into a few principal branches, or alternately branched; branches long, spreading, bare of ramuli in the lowest part, more or less copiously furnished with short branches above; these lesser branches are one or two inches long, with a broadly ovate outline, naked below, multifid above, the lesser divisions repeatedly pinnate, all the divisions alternate. The tendency to branch only at the upper portion of each rachis is equally characteristic of the ultimate divisions as of the primary and secondary. *Articulations* of the stem and branches twice or thrice as long as broad; of the ramuli shorter, with pellucid dissepiments; siphons about sixteen. *Capsules* ovate or subglobose, on short stalks or subsessile. *Tetraspores* large, in the ultimate ramuli, which are then distorted. *Colour* varying from a pale to a dark reddish-brown. *Substance* of the stem cartilaginous, of the upper portion flaccid, and closely adhering to paper.

Very closely related to *P. nigrescens*, from which it chiefly

differs in the greater length of the articulations of the stem, rather a variable character; and in the smaller number of siphons in each whorl. The ramification is somewhat more lax; the spaces of naked branch at the bases of the branching portion are longer; the filaments are more flexuous and flaccid, and the colour is usually paler than in *P. nigrescens*, but there is such a general similarity that I could be well contented to regard it as a deep-water form of that species. I have endeavoured, in the accompanying plate drawn from one of Mr. Moore's original specimens, to show all the characters proper to the species. *P. affinis* was first observed, some twenty years ago, on the coast of Antrim by Dr. Drummond of Belfast, and was soon afterwards found, in considerable plenty on the same coast, at a station a few miles distant by Mr. Moore, and was by the latter gentleman described and figured in the Survey Report of Londonderry. In the present year (1850) I collected a few specimens in Mr. Moore's locality.

Fig. 1. POLYSIPHONIA AFFINIS:—*the natural size.* 2. Small branch, with capsules. 3. Portion of the same. 4. A ramulus with imbedded tetraspores. 5. Articulations of the stem. 5. Transverse section of the stem:—*all magnified.*



W.H.H. del. et lith.

R. B & R. imp.

Plate CCXXVII.

POLYSIPHONIA SUBULIFERA, *Ag.*

Gen. Char. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. Polysiphonia (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

Polysiphonia *subulifera*; filaments setaceous, quickly becoming flaccid, flexuous, irregularly much branched; branches alternately decompounded, spreading, the lesser divisions long and rod-like; ramuli scattered, patent, subulate, simple or rarely bi-multifid; articulations visible in all parts of the frond, variable in length, many striate; tubes about thirteen, containing a coloured bag, and surrounding a narrow cavity.

Polysiphonia subulifera, *Harv. in Hook. Journ. Bot.* 1*st Series*, vol. i. p. 301. *Wyatt, Alg. Danm.* no. 178. *Harv. Man.* p. 86. *Endl.* 3*rd Suppl.* p. 46 (no. 96).

Hutchinsia subulifera, *Ag. in Bot. Zeit.* 1827, p. 638. *Ag. Sp. Alg.* vol. ii. p. 97.

Hab. Dredged in four to five or ten fathoms water, generally on Nullipore banks. Annual. Summer. Torquay, very rare, *Mrs. Griffiths.* Weymouth, "parasitical on *Rytiphlæa pinastroides* and *Polyides rotundus*, between tide-marks," *Miss White.* Belfast Bay, *Mr. Templeton.* Carrickfergus and Roundstone, at the latter place very abundant, *Mr. M'Calla.*

Geogr. Distr. Adriatic Sea, *Agardh.* Coast of France, *Lenormand!*

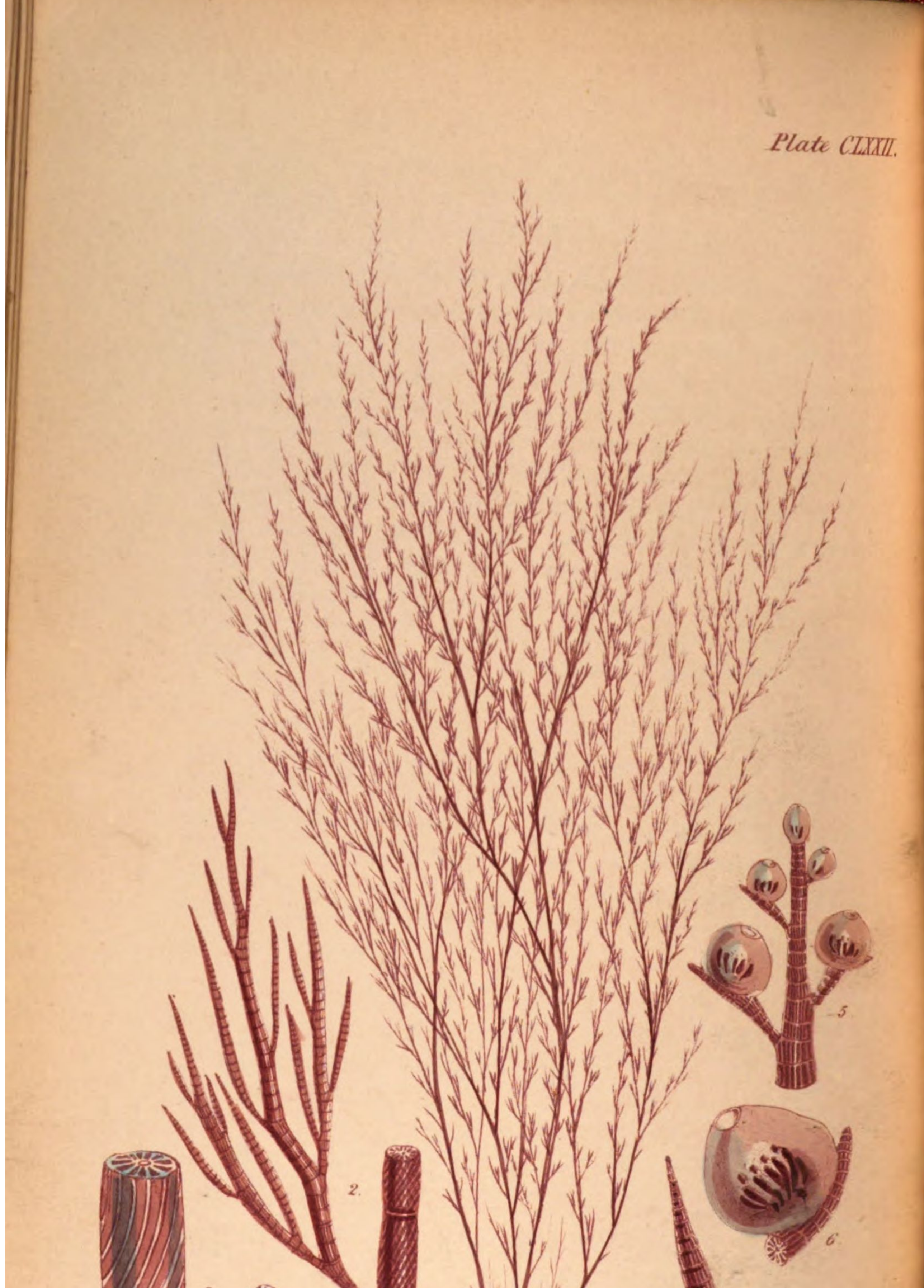
Descr. *Root* a disc, generally accompanied by grasping fibres, or else small discs rising from the lowest parts of the stems and branches. *Fronds* densely tufted, from four to six or eight inches in length, as thick as, or somewhat thicker than, hog's bristle, gradually attenuated to a point, much and irregularly branched. Main divisions irregularly forked, soon breaking up into a multitude of branches, which stand out from each other towards every side, and are repeatedly divided alternately. Lesser branches frequently long, rod-like, and subsimple, set, like the larger divisions, with short, awl-shaped, spine-like scattered ramuli. These ramuli are one or two lines long, patent, acute, and generally simple. In a young state all the apices terminate in colourless, byssoid fibres. *Articulations* varying much in length in different specimens and in different parts of the same specimen; sometimes nearly uniformly as long as broad, sometimes twice or thrice as long, many tubed. *Tubes* in the stem thirteen. *Substance* at first crisp, but quickly growing flaccid in the air. *Colour* a dark full red,

becoming brown, and sometimes even black in drying. In fresh water this plant gives out a dark brown liquid. I have never seen fructification of either kind.

This species, though sometimes found, as at Weymouth, between tide-marks, much more commonly grows at a considerable depth, so as to escape notice altogether, except when accidentally thrown ashore after storms, or when sought by dredging. It was first described by Agardh, who gathered specimens of it at Venice, but had been found many years previously by the late Mr. Templeton, in Belfast Lough. In the herbarium of that gentleman, the specimens remained undescribed until 1840, when I recognised them, and introduced that Irish habitat into the Manual. *P. subulifera* had, however, previously, in 1833, been found in England by Mrs. Griffiths and Mr. Borrer. It appears to be much more abundant on the coast of Ireland, especially in Roundstone bay, where, on different occasions, I have dredged it in considerable quantities.

Its peculiar thorny habit, well expressed by the specific name, is so unlike that of any other British species of equal size, that it cannot well be confounded with any. To the naked eye it bears a greater resemblance to young specimens of *Rytiphlæa fruticulosa* than to anything else, but is more slender and flaccid, and readily known at all times by the distinctly articulate stem and branches, which have, both externally and internally, a very different structure.

Fig. 1. POLYSIPHONIA SUBULIFERA:—*of the natural size.* 2. Portion of a branch. 3. Joints and ramulus from the same. 4. Transverse section of the stem:—*all more or less magnified.*



W.H.H. del et lith.

Reeve, Benham & Reeve imp.

PLATE CLXXII.

POLYSIPHONIA ATRO-RUBESCENS, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *atro-rubescens*; filaments setaceous, sparingly or much branched, dark brownish-red, somewhat rigid; branches long, alternate, very erect, mostly undivided, usually furnished with a second (or third) set of lesser branches, naked, or clothed with short, simple or multifid, scattered, subulate ramuli, which taper to the base and apex; articulations variable, the lower twice or thrice as long as broad, the upper gradually shorter, marked with several, spirally curved tubes; siphons about twelve; capsules broadly ovate or subrotund, sessile, nearly or quite terminal; tetraspores imbedded in multifid ramuli.

POLYSIPHONIA atro-rubescens, *Grev. Fl. Edin.* p. 308. *Hook. Br. Fl.* vol. ii. p. 331. *Harv. in Mack. Fl. Hib.* part 3. *Harv. Man.* p. 87. *Harv. Ner. Aust.* p. 53. *Kütz. Phyc. Gen.* p. 424. *Endl. 3rd Suppl.* p. 45.

POLYSIPHONIA Agardhiana, *Grev. Scot. Crypt. Fl.* t. 210. *Harv. in Hook. Br. Fl.* vol. ii. p. 331. *Wyatt, Alg. Danm.* no. 134. *Kütz. Phyc. Gen.* p. 420. *Endl.* p. 45.

POLYSIPHONIA badia, *Grev. Hook. Br. Fl.* vol. ii. p. 331.

POLYSIPHONIA denudata, *Grev. Hook. Br. Fl.* vol. ii. p. 382. *Endl. 3rd Suppl.* p. 45.

HUTCHINSIA atro-rubescens, *Lyngb. Hyd. Dan.* p. 110. *Ag. Sp. Alg.* vol. ii. p. 64.

HUTCHINSIA Agardhiana, *Ag. Sp. Alg.* vol. ii. p. 66.

HUTCHINSIA badia, *Ag. Syn.* p. 56. *Lyngb. Hyd. Dan.* p. 114. *Ag. Syst.* p. 155. *Ag. Sp. Alg.* vol. ii. p. 74.

HUTCHINSIA denudata, *Ag. Sp. Alg.* vol. ii. p. 73.

CONFERVA nigra, *Huds. Fl. Ang.* p. 595. *Dillw. Syn.* no. 162. *E. Bot.* t. 2340.

CONFERVA atro-rubescens, *Dillw.* t. 70.

CONFERVA badia, *Dillw. Syn.* no. 161. t. G.

CONFERVA denudata, *Dillw. Syn.* no. 160. t. G.

HAB. On rocks and stones in the sea, near low-water mark. Annual. Summer and autumn. Not uncommon.

GEOGR. DISTR. Atlantic coasts of Europe and North America. Falkland Islands, *Dr. Hooker.* Cape of Good Hope, *W. H. H.*

DESCR. *Root* scutate. *Fronds* densely tufted, from three to twelve inches in

length, as thick as hogs' bristle, gradually tapering to a capillary fineness, much or little branched; the main divisions once or twice forked, the rest of the branches alternate, very erect and mostly divided, long, and virgate, either naked, or more or less furnished with lateral secondary branches, which in luxuriant specimens bear a third series; all the branches set, at variable distances, with short, spine-like, very erect or appressed ramuli, 1–2 lines in length, which are at first simple, but finally become multifid, having, to the eye, a pencillate or tufted character. All the apices very much attenuated, when young, fibrilliferous. *Articulations* marked with numerous spiral tubes, the lower ones 2–3 times, the upper once and half as long as broad, the ultimate shorter than their breadth. *Siphons* twelve. *Capsules* very broad, with a wide mouth. *Tetraspores* small, always found in plants whose ramuli are most multifid or tufted. *Colour* a dark, full-red, becoming brownish, or even black in drying. Substance somewhat rigid, more or less firmly adhering to paper in drying.

So long a string of synonyms seems to speak of a plant of very variable aspect. Yet the species here figured is tolerably constant to its characters, and much less variable than some others of the genus, about which botanists have had fewer differences. This plant has appeared under *four* names in the works of most authors; the first, *P. badia*, refers to the frond in a half-grown state; *P. atro-rubescens*, to the ordinary form of the full-grown plant; *P. Agardhiana*, to a luxuriant state of the frond, coupled with an imperfect state of capsular fruit; and *P. denudata*, to a battered and denuded state of the frond.

This species, under the name *Conferva nigra*, was first published by Hudson, whose character is sufficiently descriptive, and whose synonym is authenticated by specimens existing in the Herbaria of the late Sir T. Frankland and the Rev. H. Davies. It was afterwards figured by Dillwyn, as a new species, under the name *atro-rubescens*; a name subsequently given up by that author, on discovering the identity of his plant with the *nigra* of Hudson. Subsequent writers have, without exception, adopted *atro-rubescens* as the more descriptive of the two names, though not the most ancient.

Fig. 1. POLYSIPHONIA ATRO-RUBESCENS:—*of the natural size.* 2. Part of a branch, bearing a multifid ramulus. 3. Joints from the same. 4. Cross section. 5. Apex of a fertile stem, bearing capsules. 6. A ramulus, with its capsule. 7. A ramulus with tetraspores. 8. A tetraspore.

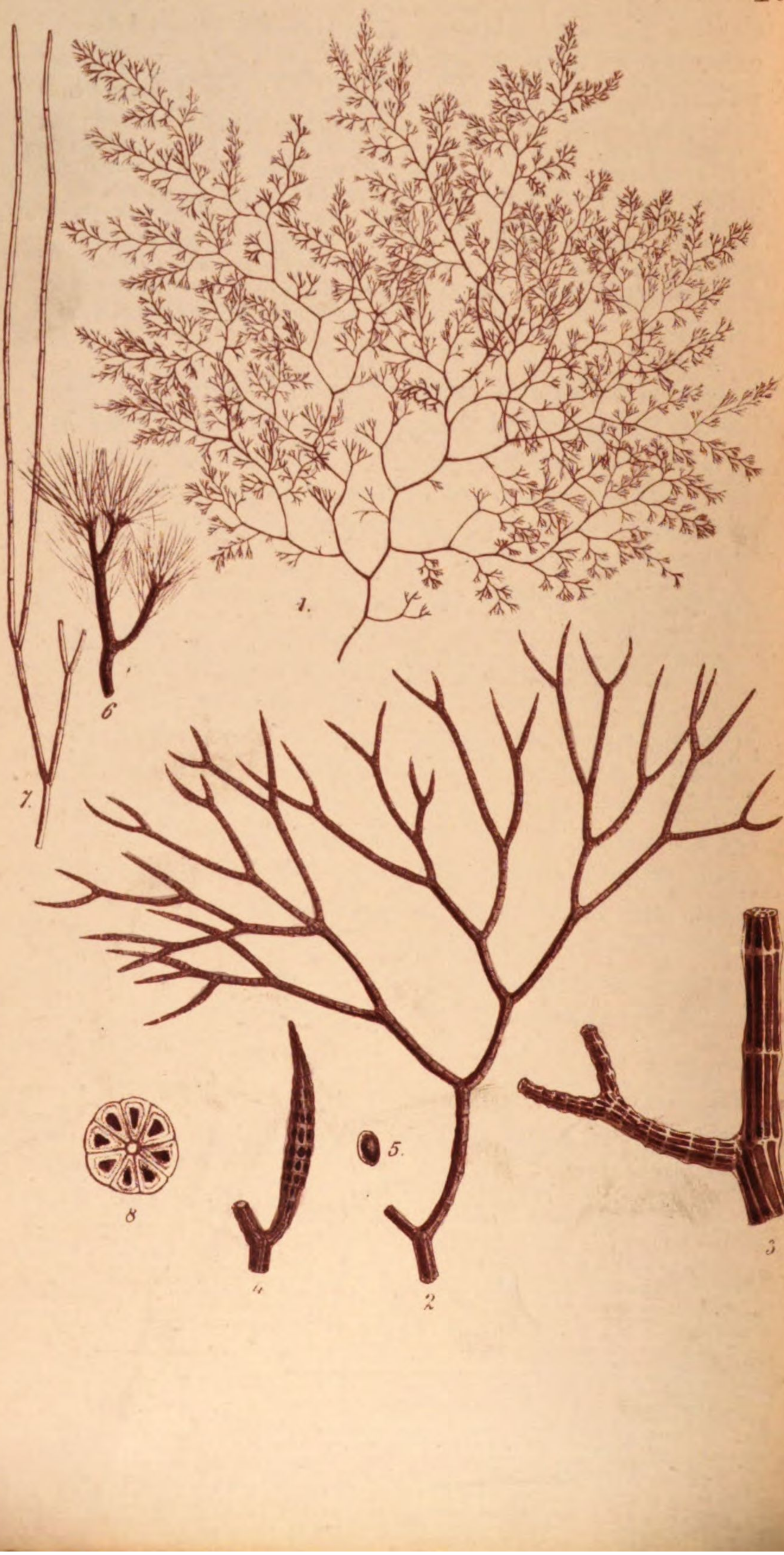

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PLATE VII.

POLYSIPHONIA FURCELLATA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed internally of parallel tubes or elongated cellules. *Fructification* twofold, on distinct plants: 1, ovate capsules (*ceramidia*) furnished with a terminal pore, and containing a mass of pear-shaped seeds; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA—from πολὺς, *many*, and σίφων, a *tube*; because the axis of the frond is composed of several tubes.

POLYSIPHONIA *furcellata*; *filaments* elongated, tufted, flexuous, repeatedly and closely dichotomous; axils broad, rounded; ramuli erect, their points somewhat hooked in; joints of the stem three to five times longer than broad.

POLYSIPHONIA furcellata, *Harv. in Hook. Br. Fl.* vol. ii. p. 332. *Man.* p. 90. *Montag. Pl. Cell. Canar.* p. 172. *Endl. 3rd Suppl.* p. 45. *Kütz. Ph. Gen.* p. 425.
HUTCHINSIA furcellata, *Ag. Sp. Alg.* vol. ii. p. 91.
LAMOUROUXIA turgidula, *Bonnem. MSS. sec. Ag.*

HAB. Very rare. Floating in the sea, at Sidmouth, *Mrs. Griffiths* and *Miss Cutler*. Dredged in Torbay, *Mrs. Griffiths*. Carrickfergus, *Mr. W. M'Calla* (1845). Annual. Summer.

GEOGR. DISTR. Atlantic shores of France, *Messrs. Bonnemaison* and *Chauvin*, sec. Ag. South shore of England. Canary Islands, *Webb*. North-east of Ireland.

DESC. *Filaments* as thick as hogs bristle in the lower part, gradually attenuated, 5–6 inches long, densely tufted and frequently much entangled, excessively branched, flexuous or zig-zag, the divisions pretty regularly dichotomous, the lower ones subdistant, the upper gradually becoming nearer to each other towards the extremities. Axils all remarkably wide; apices either straight and subulate, or hooked in; at first simple, finally producing byssoid fibres from all the upper articulations. *Stem* composed of about eight tubiform cells surrounding a narrow central tube; walls of the cells thick, endochrome comparatively narrow. Articulations varying in length in different parts of the frond; those of the larger branches 3–5 times, of the lesser about twice, and of the ultimate ramuli as long as, or shorter than, their breadth. *Colour* when recent, "a bright brick-red," which changes in the herbarium to a deep umber-brown. Substance, according to Mrs. Griffiths, "at first firm, but becoming flaccid immediately." Capsules unknown. Tetraspores frequently occur in British specimens.

I have here the satisfaction of figuring for the first time a species as rare as it is beautiful, which, till it was recently brought by Mr. Webb from the Canary Islands, was supposed to be confined to the shores of the British Channel. It was first noticed on

the coast of Bretagne by M. Bonnemaison; and added to our Flora by Mrs. Griffiths in 1827, who gathered it freely floating in the sea opposite Sidmouth. In that locality and in Torbay it has, since that period, occasionally been picked up, but the supply is neither regular every year, nor at any time has it been abundant.

Whilst this sheet was preparing for the press Mr. M'Calla discovered a new station at Carrickfergus, in the north-east of Ireland, where he obtained three specimens, one of which is of the average size of English specimens, and fully developed, the other two in a young state. These were washed on shore in October 1845, in company with a considerable quantity of the rare *Pol. subulifera* and of *Chordaria divaricata*, Ag., a species new to the British Flora, which we shall have the pleasure of figuring in our next number.

There is no British species so nearly allied to *P. furcellata* as to be confounded with it, although when examined microscopically we perceive a considerable affinity on the one hand to *P. nigrescens*, and on the other to *P. fastigiata*. Between these two species indeed, *P. furcellata* appears to me to be almost intermediate. The relative length and the structure of the joints are very much those of *P. nigrescens*, from which the dichotomous, not pinnate, ramification, the want of leading stem, bright colour, &c., abundantly distinguish it; while, on the other hand, the ramification nearly approaches that of *P. fastigiata*; but then, the nature of the joints, the colour, and the flaccid substance are very different.

There is another species which ought to be here noticed as being closely related to *P. furcellata*, namely, *P. corymbifera*, a native of the Cape of Good Hope. This, if my specimens are correctly named, is a more robust plant, with more distant dichotomies, more acute axils, and remarkable for its densely corymbose fastigiate multifid lateral branchlets, and the number of tubes contained in the stem is twelve or thirteen. It has, however, very much the habit of a luxuriant specimen of *P. furcellata*, and though truly distinct, by the above mentioned and some other minor characters, might easily, on a hasty inspection, be mistaken for that species.

Fig. 1. POLYSIPHONIA FURCELLATA:—*natural size*. 2. Branchlet. 3. Section to show the different lengths of the joints. 4. Ramulus bearing tetraspores. 5. A tetraspore (undivided?) removed. 6. Fibrilliferous apex. 7. One of the fibrillæ. 8. Transverse section of the stem:—all *magnified*.

W.H.H. del et lith.

F. Reeve, imp.

PLATE CCXCIX.

POLYSIPHONIA FASTIGIATA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; articulations longitudinally striate, composed of numerous, radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *fastigiata*; filaments rigid, setaceous, of equal diameter throughout, forming globular, fastigiate tufts, many times dichotomous; the axils patent; articulations shorter than their diameter, multistriate, with a dark central spot; siphons from sixteen to eighteen.

POLYSIPHONIA fastigiata, *Grev. Fl. Edin.* p. 308. *Harv. in Hook. Br. Fl.* vol. ii. p. 333. *Harv. in Mack. Fl. Hib.* part 3. p. 209. *Harv. Man.* ed. 2. p. 92. *Wyatt, Alg. Danm.* no. 177. *Endl. 3rd Suppl.* p. 45. *Kütz. Sp. Alg.* p. 809. *Kütz. Phyc. Gen.* p. 420. t. 50. f. 3.

HUTCHINSIA fastigiata, *Ag. Syn.* p. 53. *Hook. Fl. Scot.* part 2. p. 87. *Ag. Syst.* p. 154. *Lyngb. Hyd. Dan.* p. 108. t. 33. *Ag. Sp. Alg.* vol. ii. p. 67.

CERAMIUM fastigiatum, *Roth, Fl. Germ.* vol. iii. p. 463. *Cat. Bot.* vol. iii. p. 157.

CONFERVA polymorpha, *Linn. Syst. Nat.* vol. ii. p. 721. *Fl. Dan.* t. 395. *Dillen. Musc.* t. 6. fig. 35. *Ellis, Phil. Trans.* vol. lvii. p. 426. t. 18. fig. a. A. b. B. *Huds. Fl. Angl.* vol. ii. p. 599. *Lightf. Fl. Scot.* vol. ii. p. 989. *Dillw. Conf.* t. 44. *E. Bot.* t. 1764.

FUCUS lanosus, *Linn. Syst. Nat.* vol. ii. p. 718. *Huds. Fl. Ang.* vol. ii. p. 590.

HAB. Parasitical on the littoral *Fuci*, especially upon *Fucus nodosus*. Perennial. Summer and autumn. Very uncommon.

GEOGR. DISTR. Atlantic shores of Europe and North America. Baltic Sea.

DESCR. *Root* a minute disc. *Fronds* forming dense, globular, fastigiate tufts, from one to two or three inches in diameter. *Filaments* as thick as horse-hair below, slightly attenuated upwards, excessively branched from the base, dichotomous, either bare of lateral ramuli or furnished with a greater or less number, which are short and once or twice forked. *Apices* spreading, of nearly equal length, subulate; axils acute. Articulations shorter than their length, with hyaline dissepiments, many-striate and marked with a dark, central spot, being a bag of coloured endochrome which fills the central tube or cavity of the frond: radiating cells from sixteen to eighteen. *Capsules* ovate, near the tips of the branches, formed from the

metamorphosis of one of the prongs of the terminal forks. *Tetraspore* immersed in the terminal ramuli. *Antheridia* abundant in winter and spring, bright yellow, crowded close to the ends of the branches, oblong, affecting the colour of the tuft by their abundance. *Substance* rigid, not adhering to paper, except after long steeping. *Colour* a rich vandyke brown, becoming foxy in age or decay.

A very common species on the shores both of Europe and of North America, almost invariably infesting *Fucus nodosus* with its dark brown bushy tufts. Occasionally I have seen it growing on *F. serratus* and *F. vesiculosus*, but it is much less common on them. On the contrary, wherever *F. nodosus* occurs, there it is accompanied by this parasite. *Pol. fastigiata* grows nearer to high-water mark than any others of the genus, and is generally exposed, for many hours of each tide, to the influence of the air. This exposure and the constant alternation of circumstances probably influence the colour of its frond, and we accordingly find that it partakes of the *brown* tints of the *Fuci* among which it grows, almost to the entire extinction of the red colour, proper to the family to which its structure allies it. Besides this difference of colour, it differs from most others of its genus in having a cell, containing endochrome, within each articulation of the central or axial tube. In this respect it partakes of the character of *Bostrychia*, with which genus its colour and habitat strongly connect it. The *antheridia* are particularly abundant and of large size; and at the season when they are developed the tufts become of a yellow or orange colour. Almost every point of the branches bears its tuft.

It is difficult to account for the specific name, *polymorpha*, under which it was designated by Linnæus, for few species among the marine Algæ are less inconstant in character.

Fig. 1. Tufts of POLYSIPHONIA FASTIGIATA growing on *Fucus nodosus*:—*the natural size.* 2. Portion of a frond, to show branching. 3. Ceramidia. 4. Branchlet with imbedded tetraspores. 5. A tetraspore. 6. Apices with antheridia. 7. An antheridium. 8. Portion of a frond, partly cut longitudinally to show the internal structure. 9. A transverse section of a frond:—*all magnified.*

W.H.H. del et lith.

Reeve, L.L.D.

PLATE CXLVII.

POLYSIPHONIA PARASITICA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially, or generally, articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate capsules (*ceramidia*), furnished with a terminal pore; and containing a mass of pear-shaped spores. 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολὺς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *parasitica*; filaments slender, rigid, full-red, alternately branched, distichous; branches bi-tripinnate; pinnules closely set, erecto-patent, alternate, awl-shaped, acute; articulations about as long as broad, marked with three or four broad hexagonal oblong cells (or siphons) separated by pellucid spaces; siphons about eight, surrounding a narrow cavity; capsules ovate, on short stalks; tetraspores immersed in swollen pinnules.

POLYSIPHONIA parasitica, *Grev. Fl. Edin.* p. 309. *Harv. in Hook. Br. Fl.* vol. ii. p. 330. *Wyatt, Alg. Danm.* no. 175. *Harv. in Mack. Fl. Hib.* part 3. p. 3. *Harv. Man.* p. 85. *Endl. 3rd Suppl.* p. 46.

HUTCHINSIA parasitica, *Ag. Syst.* p. 147. *Ag. Sp. Alg.* vol. ii. p. 103.

HUTCHINSIA Möstingii, *Lyngb. Hyd. Dan.* p. 116. t. 36.

CONFERVA parasitica, *Huds. Fl. Ang.* p. 604. (?) *Dillw. Conf. Syn.* p. 87. *E. Bot.* t. 1429.

HAB. Parasitical on the larger Algæ, and, much more frequently, on various species of *Melobesia*, at the limit of low water, and in from four to fifteen fathoms water. Rather rare; but very generally distributed on the British coasts, from Orkney to Cornwall. Remarkably fine on the Ayrshire coast, and at Arran, *Rev. D. Landsborough.*

GEOGR. DISTR. Atlantic shores of Europe, from the Fœroe Islands to Spain. Malta, *Dr. Lyall.*

DESCR. *Fronds* several from the same base, but not densely tufted, from one to three inches in height, with an undivided or once-forked stem, not quite so thick as hog's bristle, furnished throughout its length with closely-set, alternate, distichous branches. *Branches* very variable in length; in some specimens not half an inch long; in others, almost two inches, regularly bi- or tripinnate; the pinnæ gradually diminishing in length from the base to the apex, closely set, erecto-patent, alternate; pinnules from half a line to a line in length, simple, subulate, alternate, acute. Sometimes the branches are nearly naked, the pinnæ few, and simply pinnate; and towards the base of the branches, in large specimens, the lower pinnæ are short, simple, and recurved. *Articulations* of the pinnæ about as long as broad, those of the pinnules shorter, marked with several oblong tubes, which are pointed at both ends, and separated by hyaline spaces. A transverse section

shows eight tubes, surrounding a narrow cavity. *Capsules* ovate, formed out of one of the pinnules, supported on a short stalk, and containing a tuft of pear-shaped spores. *Tetraspores* ranged in a single series, in swollen pinnules. *Colour*, when growing, a fine, clear red; assuming, in drying, more or less of brown; and, if dried without steeping in fresh water, imparting a brown stain to the paper. *Substance* rather rigid, imperfectly adhering to paper.

I am happy to have this opportunity of returning my best thanks to the *Rev. D. Landsborough*, of Saltcoats, for a series of most beautiful specimens of this charming Alga; by much the finest which I have ever seen. The larger figure in our plate is taken from one of this gentleman's specimens; the smaller from one of the usual size. The difference is strikingly in favour of the Scottish plant. To Mr. Landsborough I am also indebted for the first capsule-bearing plant which I possessed; this kind of fruit being of more rare occurrence than tetraspores.

Polysiphonia parasitica is, I believe, a much more generally distributed species on our shores, than is commonly supposed; but owing to its habitat, it very frequently escapes detection. Unless it be obtained by dredging, which, in favourable localities, is, perhaps, the most certain means of procuring specimens, it can only be had by examining the submersed perpendicular sides of ledges of rock, at the extreme limit of low water. These ledges are frequently coated over with a thin spreading *Melobesia*, or with the base of *Corallina officinalis*. On these Corallines the *Polysiphonia* grows. I once found it on the stem of *Laminaria digitata*, but it was of very small size.

This species is very closely related to *Pol. pennata* of the Mediterranean, and to *P. dendroidea*, a beautiful Peruvian Alga. These plants have a *habit* more resembling that of the genus *Rytiphlæa*, but in their technical characters they do not accord with that group; and there is nothing to distinguish them in structure from other *Polysiphoniæ*. In all three the frond is slightly compressed; but this character is not peculiar to them.

Fig. 1. POLYSIPHONIA PARASITICA, growing on *Melobesia lichenoides*:—*of the natural size.* 2. Portion of a pinna. 3. Pinnule with *tetraspores*. 4. Branchlet with a capsule. 5. Portion of the frond. 6. Transverse section:—*all more or less magnified.*

W. H. H. del et lith.

R.B. & R. imp.

PLATE CCLXXXIV.

POLYSIPHONIA BYSSOIDES, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. *Polysiphonia* (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *byssoides*; stems rigid, setaceous, cartilaginous, distichously branched, decomposito-pinnate; branches patent, more or less densely clothed with short, slender, dichotomous, single-tubed, byssoid ramelli; articulations of the stem variable in length, 3–4-striate.

POLYSIPHONIA byssoides, *Grev. Fl. Edin.* p. 309. *Harv. in Hook. Br. Fl.* vol. ii. p. 334. *Harv. Man.* ed. 2. p. 92. *Wyatt, Alg. Danm.* No. 85. *Harv. in Mack. Fl. Hib.* part iii. p. 209. *Endl.* 3rd Suppl. p. 46. *Kütz. Phyc. Gen.* p. 430.

HUTCHINSIA byssoides, *Ag. Sp. Alg.* vol. ii. p. 99.

CONFERVA byssoides, *Eng. Bot.* t. 547. *Dillw. Conf.* t. 48.

CERAMIUM molle, *Roth. Cat. Bot.* vol. iii. p. 138.

FUCUS byssoides, *Good. & Woodw. Linn. Trans.* vol. iii. p. 229.

HAB. On stones and shells, and various Algæ; near low-water mark and in 4–5-fathom water. Generally distributed on the English and Irish coasts;—more rare in Scotland. Orkneys, *Messrs. Thomson and M'Bain.* Frith of Forth, *Sir J. Richardson*, &c.

GEOGR. DISTR. Atlantic shores of Europe. Adriatic, *C. A. Agardh.*

DESCR. *Root* a small disc. *Fronds* from six to twelve inches long or more, as thick as hog's bristle, with an undivided stem running through the whole plant, closely set throughout with distichous, alternate branches similar to the stem, and like it furnished with a second, and in large specimens a third series of lesser branches. The lower branches are longest, the rest gradually shorter upwards, so that the general outline of a frond is broadly ovate, or pyramidal. All the branches and their divisions are clothed with short, byssoid, single-tubed, dichotomous ramelli (*leaves*), which appear to be of the same nature as the fibres in which the young branches of all *Polysiphoniæ* terminate. Every portion of the stem and branches is pellucidly articulate, the articulations 3–4-tubed, the transverse section exhibiting seven siphons; these articulations vary much in length in some specimens, being 4–6 times longer than broad, in others but twice or thrice exceeding their diameter: those of the smaller branches are usually short. *Capsules* ovate, sessile, scattered on the smaller branches. *Tetraspores* immersed in the branchlets, each formed from an articulation. *Colour* a clear and beautiful crimson lake, becoming brownish on exposure, and commonly a dark

red-brown in drying. *Substance* when young, extremely soft and flaccid, most closely adhering to paper; when old, rigid, and coarse, with squarrose ramelli.

One of the handsomest of the British species of this extensive genus, especially when young, at which period the whole plant is of the softest substance and most delicate rosy-red colour. In some respects this species connects the genera *Polysiphonia* and *Dasya*, for here, although the tetrasporic fruit is altogether that of a true *Polysiphonia*, the habit of the frond is that of *Dasya*; the byssoid ramelli of this species being identical with those found in the *Dasyæ*. These ramelli appear to be also of the same nature as the fibres found terminating the young branches of other *Polysiphoniæ*, as well as *Rhodomelæ*, &c., and are probably to be regarded as leaves in a very imperfect state of development. In other species they are only found on young parts, and appear to be actively engaged in the growth of the part on which they are found; but in *P. byssoides* they exist at every period, and on all parts of the frond. On old plants or old branches, however, they lose much of their delicacy, and become harsh and squarrose.

Fig. 1. POLYSIPHONIA BYSSOIDES:—*the natural size.* 2. Portion of the frond, with *capsules*. 3. Branchlet with tetraspores. 4. A tetraspore. 5. One of the byssoid ramelli. 6. Transverse section of the stem:—*all magnified.*

W.H.H. del. et lith.

R.B. & B. imp.

PLATE CCLIII.

DASYA COCCINEA, *Ag.*

GEN. CHAR. *Frond* filamentous; the stem and branches mostly opake, irregularly cellular (rarely pellucid and longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the ramuli jointed, single tubed. *Fructification* two fold, on distinct plants: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*) containing tetraspores ranged in transverse bands. DASYA (*Ag.*),—from δασυς, *hairy*.

DASYA *coccinea;* stems elongate, robust, rough with hair-like fibres, distichously branched; branches bi-tri-pinnate; pinnulæ multifid, single-tubed, their articulations as long as broad.

DASYA coccinea, *Ag. Spec. Alg.* vol. ii. p. 119. *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Wyatt, Alg. Damn. No.* 41. *Harv. in Mack. Fl. Hib.* part 3. p. 209. *Harv. Man.* p. 97. *Endl. 3rd Suppl.* p. 44.

ASPEROCAULON coccineum, *Grev. Fl. Ed.* p. 309.

ELLISIUS coccineus, *Gray, Br. Pl.* vol. i. p. 334.

TRICHOTHAMNION coccineum, *Kütz. Phyc. Gen.* p. 415.

HUTCHINSIA coccinea, *Ag. Syn.* p. 26. *Hook. Fl. Scot.* part 2. p. 89. *Ag. Syst.* p. 147.

CALLITHAMNION coccineum, *Lyngb. Hyd. Dan.* p. 124.

CONFERVA coccinea, *Huds. Fl. Ang.* p. 603. *With.* vol. iv. p. 141. *Dillw. Conf.* t. 36. *E. Bot.* t. 1055.

CONFERVA plumosa, *Ellis, Phil. Trans.* vol. lvii. p. 425. t. 18. f. *c. C. d. D. Lightf. Fl. Scot.* p. 996.

CERAMIUM hirsutum, *Roth, Cat. Bot.* vol. ii. p. 169. t. 4.

Var. β. *squarrosa;* branches destitute of hair-like fibres, sparingly and often irregularly branched; ramuli squarrose.

CERAMIUM patens, *Grev. Crypt. Scot.* t. 261.

HAB. On rocks and Algæ near low-water mark; β. dredged in deep-water. Annual. Summer. Common.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to Spain.

DESCR. *Root*, a conical disc. *Stem*, six to eight inches long or more, mostly undivided, as thick as small cord at the base, gradually attenuated, opake, and clothed with short, shaggy hairs, pretty regularly tri-pinnate pinnæ long, spreading, lanceolate closely pinnulated; the ultimate pinnulæ forked or multifid, or cloven to the base into numerous simple, single-tubed ramuli. *Articulations* visible in the smaller branches only, many tubed, and very short, interrupted by transverse bands of small, irregular cells. A trans-

verse section of the stem exhibits nine radiating siphons disposed round a small cavity, and surrounded by a band of small cells, of thickness varying according to the age of the part from which the section is made. Articulations of the ramuli very short. *Ceramidia* ovate, with thick walls. *Stichidia* oblong, suddenly mucronate, nearly sessile. *Colour*, a fine deep crimson, becoming brighter after immersion in fresh-water. β. is much smaller and more squarrose in its branching, sometimes nearly bare of ramuli.

A well-known plant, common along the coasts of Europe, and a great favourite with collectors of Sea-weeds for ornamental purposes.

I have mentioned but one variety, as worthy of note; but this variety puts on so many forms that it might be split into two or three. In Dr. Greville's figure (Crypt. Scot. t. 261,) the species appears in its most depauperated state, so different in aspect from the normal condition, that without an inspection of connecting links, it would be difficult to suppose the two forms belonged to one species. But by dredging in sandy bays and among *Nullipores* a complete series of forms, connecting the most luxuriant with the most lank, may be collected. Those from deep-water are generally very irregularly branched, and seldom produce fruit. Specimens having *stichidia* are always more slender and delicate than those that bear *ceramidia*.

Fig. 1. DASYA COCCINEA. 2. The var. β. *squarrosa* :—*both of the natural size.* 3. *Ceramidium* with accompanying ramuli. 4. Section of ceramidium. 5. Stichidium, with ramuli. 6. A tetraspore. 7. Section of lower part of the stem. 8. Section of a branch :—*all magnified.*

Reeve imp

PLATE XL.

DASYA OCELLATA, *Harv.*

GEN. CHAR. *Frond* filamentous; the *stem* and *branches* mostly opake, irregularly cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes; the *ramuli* jointed, single-tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*), containing *tetraspores* ranged in transverse bands. DASYA (*Ag.*)—from δᾶσυς *hairy*.

DASYA *ocellata*; stems subsimple, beset on all sides with long, erecto-patent, dichotomous, pencilled ramuli; articulations three or four times longer than broad; pods linear-lanceolate, attenuated, tapering to an acute point.

DASYA ocellata, *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Mack. Fl. Hib.* part 3. p. 210. *Wyatt, Alg. Danm.* no. 179. *Harv. Man.* p. 97. *Kütz. Phyc. Gen.* p. 414.

DASYA simpliciuscula, *Ag. Sp. Alg.* vol. ii. p. 122 (1827). *J. Ag. in Linn.* vol. xv. p. 35. *Alg. Medit.* p. 118.

CERAMIUM ocellatum, *Gratel. in Hist. Soc. Med. Montp.* 1807. p. 34.

HUTCHINSIA ocellata, *Ag. Syst.* p. 157 (1824).

HAB. On mud-covered rocks in the sea, rare. Annual. Summer. Abundant on the Pier, Torquay, *Mrs. Griffiths*. Whitsand Bay, *Dr. Walker Arnott*. Wicklow, *W. H. H.* Smerwich Harbour, Kerry, *Mr. W. Andrews*. Balbriggan, *Mrs. Gregg* and *Miss Gower*. Trevol, *Rev. W. S. Hore*.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea. South of England. East and South of Ireland.

DESCR. *Root* a small disc. *Fronds* one, two, or three inches high, tufted. *Stems*, in the smaller specimens, simple or once forked at the base; in the larger, twice or thrice forked, and occasionally having a few lateral, simple branches; as thick as hog's bristle, opake, cartilaginous, without external joints, the surface cellules being irregular. *Ramuli* clothing the stem and branches from the base to the apex, at which point they are remarkably dense, inserted quadrifariously, 3–5 lines long, slender, erect, several times forked near their base, cylindrical, the apices much produced, but not tapering, blunt. *Articulations* of the ramuli 3–4 times longer than broad, single-tubed. *Fructification*; *Ceramidia* (not yet found on British specimens). *Stichidia* or *pods* shortly pedicellate, borne on the ramuli, narrow, lanceolate, gradually tapering from the middle to an acute apex, straight or gracefully curved, slightly constricted at close intervals, producing in transverse bands, numerous small dark-purple tetraspores. *Colour* a brownish or a bright purple. *Substance* membranaceous, adhering to paper.

This little plant here figured, was first described by Grateloup, in the year 1807, under the specific name which I adopt in preference to that proposed by Agardh twenty years subsequently. By the term *ocellatum*, Grateloup no doubt intended to allude to the eye-like spots caused by the density of the ramuli at the tips of the branches. The branches, indeed, when the plant is displayed on paper resemble delicate feathers, each marked with an eyelet. When growing, Mrs. Griffiths compares them with equal propriety, to the brushes with which bottles are cleaned

Dasya ocellata was added to the British Flora by Mrs. Griffiths, who found it plentifully fringing the base of the small harbour-pier at Torquay, in which situation it is constantly covered with mud, from which obscurity, a less zealous and acute observer, would not have redeemed it. It can only be approached in a boat, at extreme low water. In this situation it has continued to grow for several years. Of recent date it has been discovered in two or three Irish localities, at either side of the kingdom. From one of these, Balbriggan, the specimen here represented, and which I owe to the kindness of Miss Gower, was procured. It is of the largest size that I have seen, the majority of British individuals being not above an inch and a half in length, and either quite simple or scarcely branched.

Fig. 1. DASYA OCELLATA; a tuft:—*natural size*. 2. Portion of a branch 3. Ramulus with pods; *both magnified*.

W.H.H. del et lith.

R.B. & R. imp.

PLATE CCXXIV.

DASYA ARBUSCULA, *Ag.*

GEN. CHAR. *Frond* filamentous; the *stem* and *branches* mostly opake, irregulary cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the *ramuli* jointed, single tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*), containing *tetraspores* ranged in transverse bands. DASYA (*Ag.*), from δασυς, *hairy*.

DASYA *arbuscula*; stems much and irregularly branched, beset on all sides with short, divaricating, dichotomous ramuli, scarcely tapering upwards; articulations from two to four times longer than broad; apices spreading, rather obtuse; stichidia elliptic-oblong, mucronate; ceramidia urceolate, with a long, cylindrical neck.

DASYA arbuscula, *Ag. Sp. Alg.* vol. ii. p. 121. *J. Ag. Symb.* p. 33. *J. Ag. Alg. Medit.* p. 118. *Harv. Man.* p. 98. *Endl. 3rd Suppl.* p. 44. *Mont. Ann. Sc. Nat.* vol. xv. p. 173.

DASYA Hutchinsiæ, *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Harv. in Mack. Fl. Hib.* part 3. p. 210.

CERAMIUM Boucheri, *Duby, 2nd Mem.* p. 15. *Crouan, in Desm. Pl. Crypt.* no. 302 and 303.

CONFERVA arbuscula, *Dillw.* t. G. (but not t. 85).

HAB. On rocks, at the verge of low water-mark; a more slender variety frequently dredged in from four to six or eight fathoms water. Annual. Summer. Not uncommon on the shores of the West of Ireland, and the North and West of Scotland. Particularly fine in Bantry Bay, *Miss Hutchins.* Rare in England. Salcombe, and the Land's End, *Mr. Ralfs.* Mewstone, Plymouth, *Rev. W. S. Hore.*

GEOGR. DISTR. Atlantic Shores of France and Spain. Mediterranean Sea.

DESCR. *Root*, a small disc. *Fronds* from one to three or four inches high, as thick as hog's bristles, irregularly much branched in a manner between alternate and dichotomous; sometimes all the main divisions are pretty regularly dichotomous; sometimes regularly alternate; the lesser branches are generally alternate, much crowded to the apices, and decompound above, the whole habit of the plant being strikingly bushy. *Stem* and *branches* opake, inarticulate, marked with irregular cells. *Ramuli* densely covering all parts of the frond except the older parts of the stem, directed to every side, one to two lines long, somewhat rigid, of nearly equal diameter throughout, divaricate, several times forked, the axils patent, articulate, their articulations from two to four times longer than broad, cylindrical. *Ceramidia* (rather rarely formed) borne on short, inarticulate peduncles, surrounded by a few jointed ramuli, roundish-urceolate, the apex produced

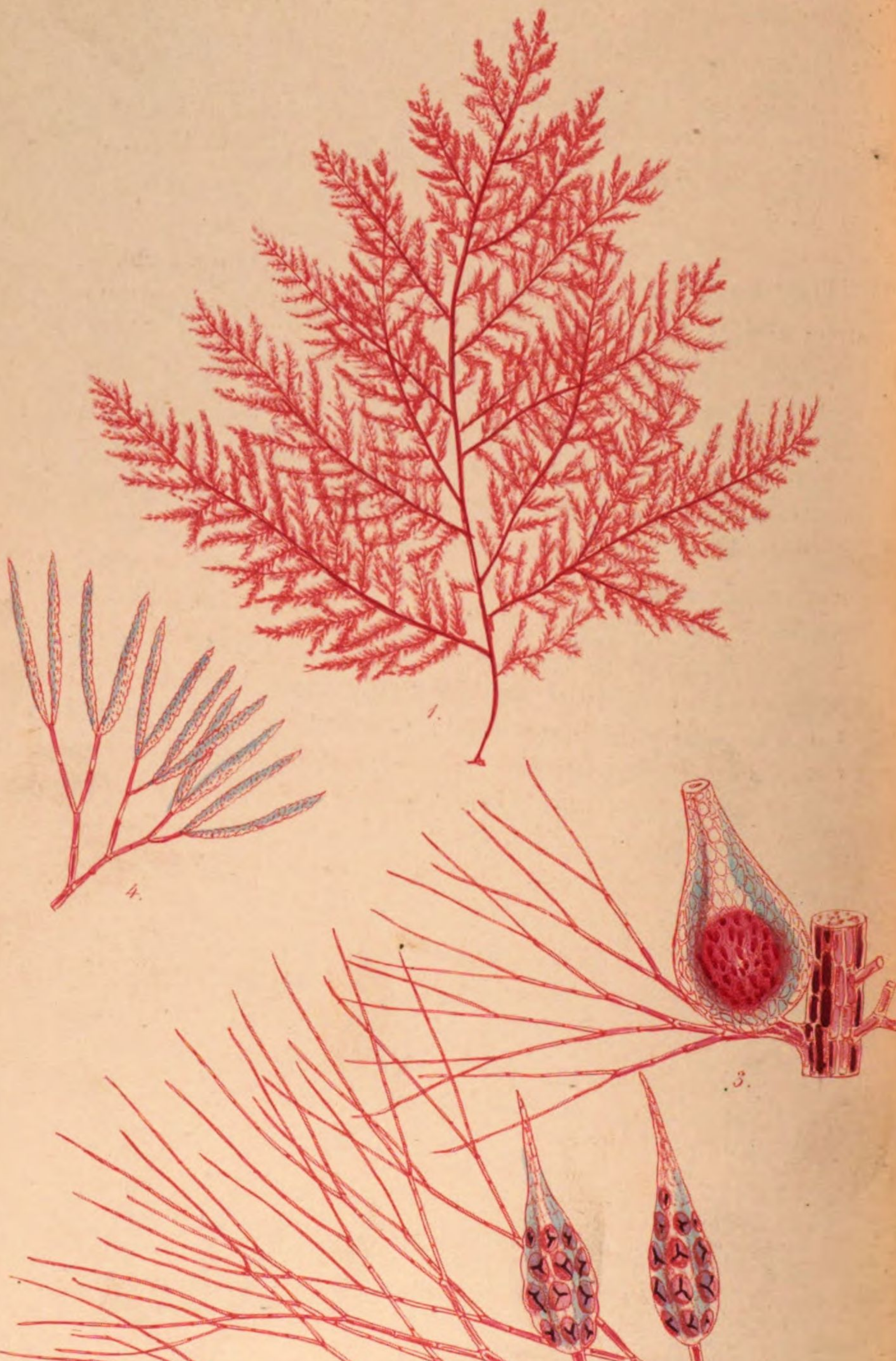
into a long cylindrical neck; spores minute, of various shapes, densely crowded into a spherical mass. *Stichidia* borne on the ramuli, elliptic-oblong, with a sharp point, laxly cellular, containing three or four rows of roundish tetraspores. *Tubes* in the stem five, surrounding a cavity. *Substance* rather crisp, becoming soft on exposure, and closely adhering to paper in drying. *Colour* variable; sometimes clear crimson-lake; at other times more or less tinted with brown or yellow, and sometimes dark brown. In all cases the frond discharges a fine crimson powder on maceration in fresh water.

This pretty plant was originally discovered by Messrs. Hooker and Borrer on the shores of the Orkney Islands, and has been found at various places along the western shores of Britain, to the extremity of the Land's End. Its most abundant stations, are on the west of Ireland, in several bays of which coast it reaches a large size. On the Continent it has been found along the coasts of France and Spain, and in the Mediterranean.

There are two principal varieties of this species; one of them found on rocks near low-water mark, the other dredged in deeper water, and often on a sandy or shingly bottom, or among *Zostera*. In the first, which is represented in our figure, the frond is more robust and bushy, the branches more regularly alternate, and the colour frequently very dark. But this last character varies according to minor circumstances of each locality. This variety is frequently found in fruit, the *pods* being more commonly found than the *capsules*. In the second variety the stems are more slender, the branches much divaricated, and the order of branching more or less dichotomous, while the ramuli are less dense, and more squarrose, and so far as I know, always barren. At first sight such specimens might pass for a different species, but there are innumerable intermediate forms.

The *D. scoparia* of the Cape of Good Hope, and *D. collabens* of New Zealand nearly resemble this species in habit, but differ by some seemingly essential characters.

Fig. 1. DASYA ARBUSCULA:—*of the natural size.* 2. A branch bearing *stichidia.* 3. Ramulus from the same, with two *stichidia.* 4. Tetraspore. 5. Branch bearing *ceramidia.* 6. A *ceramidium* from the same, on its stalk. 7. Transverse section of the stem:—*all more or less magnified.*



W.H.H. del. et lith.

R.B. & R. imp.

PLATE CCXXV.

DASYA VENUSTA, *Harv.* (*n. sp.*)

GEN. CHAR. *Frond* filamentous; the *stem* and *branches* mostly opake, irregularly cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the *ramuli* jointed, single tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*) containing *tetraspores* ranged in transverse bands. DASYA (*Ag.*), —from δασυς, *hairy*.

DASYA *venusta*; frond pyramidal, decompoundly pinnate; the branches clothed with exceedingly slender, flaccid, many times dichotomous, attenuated ramuli; articulations five or six times longer than broad; stichidia pedicellate, ovoid, much acuminate; ceramidia ovate-urceolate, with a protruding mouth.

DASYA venusta, *Harv. in Herb. T. C. D.*

HAB. Cast on shore. Annual. Summer and Autumn. Very rare. Discovered on the shores of Jersey, by *Miss White* and *Miss Turner*.

GEOGR. DISTR. ——?

DESCR. *Root*, a small disc. *Stem* three or four inches long, as thick as hog's bristles, undivided, but furnished throughout with numerous alternate, lateral branches, the lowest of which are longest, the rest gradually shorter towards the apex. *Branches* undivided like the stem, and like it furnished with a second series of lesser branches which likewise diminish in length towards the extremities; these again, in large specimens, bear a third series; each set being smaller and more slender than the preceding. The main stem is generally bare of ramuli; but all the branches and their divisions are clothed with very slender and flaccid, jointed ramuli, one or two lines in length, and very many times dichotomous: these rapidly diminish in diameter at each successive forking, and at length are reduced to cob-web thinness at the extremities. *Axils* acute. *Articulations* cylindrical, five or six times as long as broad. *Ceramidia* borne on short, inarticulate peduncles, surrounded by a few jointed ramuli, ovate-urceolate, gradually tapering into a conical neck, containing a dense, globose mass of small spores. *Stichidia* borne on the ramuli, pedicellate, ovate, much acuminate, with a long acute point, containing three or four rows of roundish tetraspores. *Substance* very tender and flaccid, strongly adhering to paper in drying. *Colour*, a fine crimson-lake. In fresh-water it gives out a crimson powder.—Sometimes the ramuli are tipped with linear-lanceolate, pod-like bodies, full of minute granules; apparently *antheridia* (fig. 4).

In the year 1846 I received from Miss White a small specimen of this plant, which at that time I laid aside, as a variety of *D. ar-*

buscula; and a short time afterwards Miss Turner supplied me with a fine specimen that at once convinced me that the plant was different from *D. arbuscula*, but left me in doubt whether it ought not to be referable to the *D. corymbifera* of J. Agardh. Of that species I possess a small morsel on talc, and as far as I can decide from an imperfect fragment, our plant is different; and it is also abundantly different from any other *Dasya* with which I am acquainted. In the byssoid fineness of its ramuli it approaches *D. elegans*, but differs in habit and in the form of its *stichidia* and *ceramidia*. The habit of our new plant is indeed rather that of *Pol. byssoides* or of *Seirospora Griffithsiana* than of any *Dasya* known to me, and may be said to be intermediate in aspect between those two beautiful plants. The conical outline is very characteristic; but it is on the extreme slenderness and repeated division of the ramuli, and the shape of the stichidia that I chiefly rely for its diagnosis.

I am much indebted to Miss White and Miss Turner for specimens of Jersey Algæ, and I would willingly discharge a portion of the debt by inscribing the present beautiful plant with the name of its fair discoverer, could I determine to which of the ladies the merit belongs. But as this point is doubtful, I have chosen a specific name which is at the same time descriptive of the elegance and grace of the plant and, in its derivation, allusive to the fairer portion of creation in general.

Fig. 1. DASYA VENUSTA; the *natural size*. 2. A ramulus bearing *stichidia*. 3. A *ceramidium* on its stalk. 4. Apex of a ramulus, bearing *antheridia*:— all highly *magnified*.

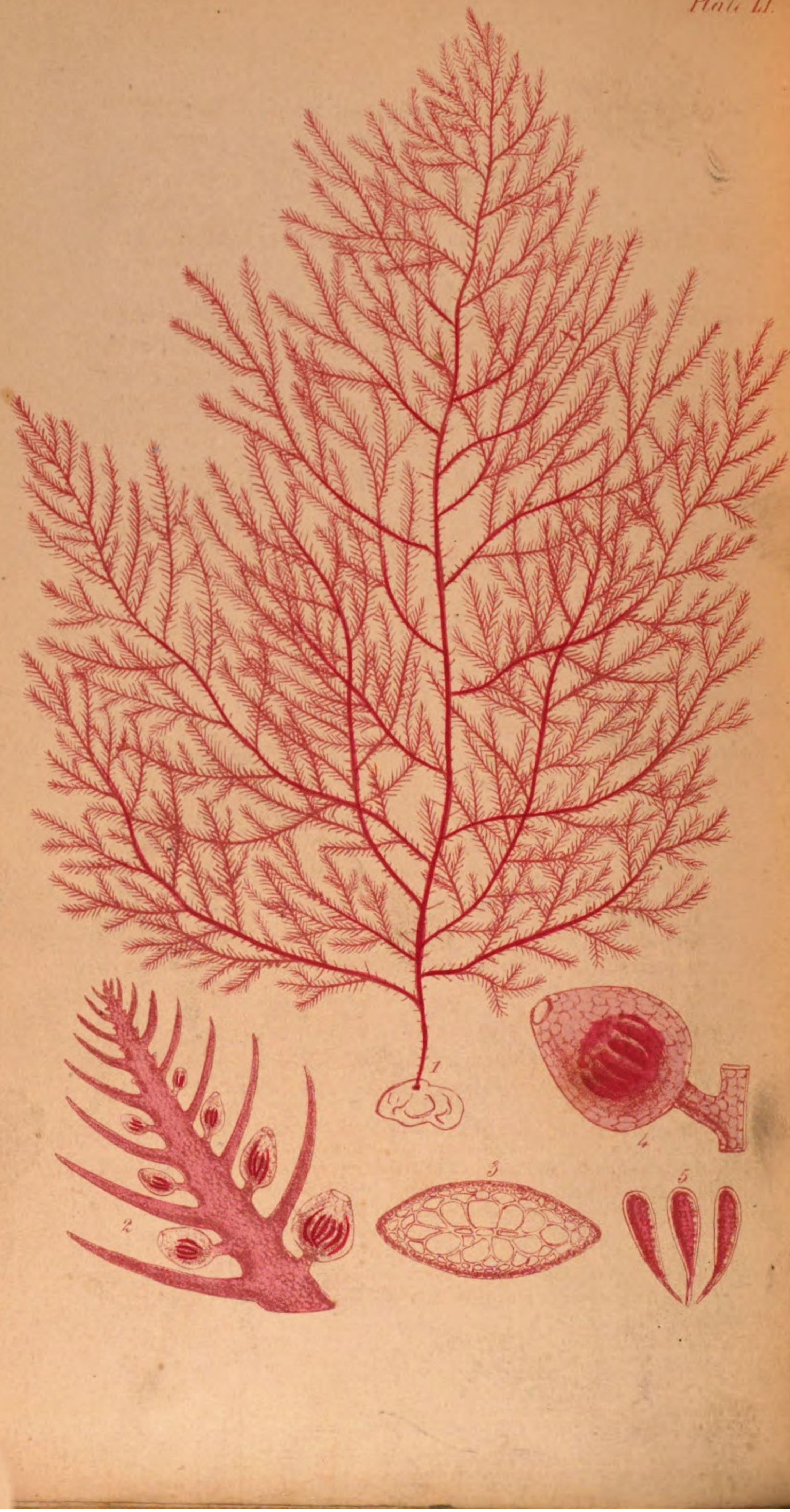

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Plate LI.

BONNEMAISONIA ASPARAGOIDES, *Ag.*

Gen. Char. *Frond* filiform, inarticulate, compressed or plane, much branched, the branches margined with distichous, subulate, alternate ciliæ. *Fructification*; ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores. Bonnemaisonia (Ag.)—in honour of *M. Bonnemaison*, a French naturalist.

Bonnemaisonia *asparagoides*; frond compressed or sub-terete; capsules stalked, opposite the ciliæ.

Bonnemaisonia asparagoides, *Ag. Sp. Alg.* vol. i. p. 197. *Syst.* p. 246. *Grev. Alg. Brit.* p. 107. t. xiii. *Hook. Br. Fl.* vol. ii. p. 295. *Harv. in Mack. Fl. Hib.* part 3. p. 197. *Harv. Man.* p. 68. *J. Ag. Alg. Medit.* p. 116. *Endl. 3rd Suppl.* p. 43. *Kütz. Phyc. Gen.* p. 438.

Plocamium asparagoides, *Lam. Ess.* p. 50.

Ceramium asparagoides, *Roth. Cat. Bot.* vol. iii. p. 110.

Fucus asparagoides, *Woodw. in Linn. Trans.* vol. ii. p. 29. t. 6. *E. Bot.* t. 571. *Turn. Syn.* vol. ii. p. 364. *Turn. Hist.* t. 101.

β, *teres*; frond capillary, terete; ciliæ very long.

Hab. On submarine rocks, near low water mark, and at a greater depth. Annual. June to September. Yarmouth, *Mr. Wigg*. Cromer, *Mr. D. Turner*. Cornwall coast, *Mr. Stackhouse*. Sunderland, *Mr. Weighell*. Torquay, *Mrs. Griffiths*. Torpoint, *Rev. W. S. Hore*. Falmouth, *Miss Warren*. Mount's Bay, *Mr. Ralfs*. Scilly Islands, *Miss White*. Jersey, *Miss White and Miss Turner*. Bantry Bay, *Miss Hutchins*. Donaghadee, *Mr. Templeton*. Belfast Bay, *Dr. Drummond*. Miltown Malbay, *Mr. J. Fennell*. Kilkee, Kingstown Harbour, and Wicklow, *W. H. H.* Howth, *Miss Gower*. Malahide and Carrickfergus, *Mr. Mc' Calla*. Saltcoats, *Rev. D. Landsborough*. Ardrossan, *Major Martin*.

Geogr. Distr. Atlantic shores of Europe, from Sweden (*Aresch.*!) to Spain. Mediterranean Sea, *J. Agardh*.

Descr. *Root* a small disc. *Fronds* either solitary or somewhat tufted, from four inches to a foot in length, commonly compressed, rarely cylindrical or nearly so, varying in breadth from the thickness of a bristle to nearly a line, furnished with an undivided stem which is set throughout its whole length, except for a short distance above the base with alternate, closely placed, patent branches, the lowermost of which are the longest, the upper being gradually shorter as they approach the apex: thus giving to the frond an ovate outline. *Lower* branches similar to the stem in all respects, furnished with a second, third, or even fourth series of lesser branchlets; upper branches less divided. Every part of the frond is pectinated, at distances of a line or less, with subulate, alternate ciliæ, a line in length; on the older stems only are they partially obliterated. The *capsules*, which are invariably

placed opposite to the ciliæ, are ovate, supported on a short stalk, and contain a tuft of pear-shaped spores; they are formed from metamorphosed branches, not from ciliæ; a fact proved by their position being the same as that of normal branches, and illustrated by specimens gathered by *Mrs. Wyatt*, in which they are partly converted into ramuliferous branchlets. *Colour*, a fine, pellucid crimson. *Substance* soft, flaccid, and adhering to paper in drying. Var. β differs from the common form in being cylindrical, with ramuli twice as long as usual.

A highly beautiful species, and so unlike any other British Alga that it must be recognized at a glance. The delicate ciliæ which border every part of the frond, and which are arranged with strict regularity, being always perfectly distichous, and placed *alternate* to each other, and *opposite* either to a capsule or to a branch, taken in connection with the cellular frond and brilliant colour, afford marks that cannot be mistaken.

Bonnemaisonia asparagoides was discovered by Mr. Wigg, whose name is so often mentioned in connection with our rarer Algæ, and first described by Mr. Woodward, in the second volume of the 'Linnæan Transactions'. It has since been found on many of the European shores, but not yet, that I am aware of, out of Europe.

The pear-shaped spores which the capsules contain, are said, by authors, to be *compound*, that is, composed of several separate sporules, like those of *Fucus serratus*, or *Cutleria multifida*. This character, though I have repeatedly looked for, I have never been able to observe; to me they appear to be filled with a homogeneous, granular matter, in all respects similar to what occurs in the other Chondrieæ. *Tetraspores* have not yet been found on this Alga; to judge by analogy, they ought to exist, if formed at all, in the ciliæ, and in specimens where capsules were wholly suppressed. *Capsules* are abundantly produced, and on the very numerous specimens which have come under my notice, though they have varied greatly in number upon each, I never saw any specimen from which they were wholly absent.

Fig. 1. BONNEMAISONIA ASPARAGOIDES:—*natural size.* 2. Apex of a branch showing capsules in different stages of growth. 3. Transverse section of a branch. 4. A capsule. 5. Spores:—*all more or less highly magnified.*

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PLATE LV.

LAURENCIA PINNATIFIDA, *Lamour.*

GEN. CHAR. *Frond* cylindrical, or compressed, linear, pinnatedly branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, tri-parted tetraspores imbedded in the ramuli. LAURENCIA (*Lamour.*),—in honour of *M. de la Laurencie*, a French naturalist.

LAURENCIA *pinnatifida*; frond compressed or subcylindrical, cartilaginous, bi-tripinnatifid, the divisions alternate; the ultimate ones linear, erecto-patent, simple or lobed.

LAURENCIA pinnatifida, *Lamour. Ess.* p. 42. *Grev. Alg. Brit.* p. 108. t. xiv. *Hook. Br. Fl.* vol. ii. p. 296. *Harv. in Mack. Fl. Hib.* part 3. p. 198. *Wyatt, Alg. Danm.* no. 113. *Harv. Man.* p. 69. *Mont. Pl. Canar.* p. 154. *Hook. fil. et Harv. Alg. Nov. Zeal.* no. 65. *Hook. fil. Fl. Ant.* part. i. p. 184. *J. Ag. Alg. Medit.* p. 114. *Mont. Voy. Pole Sud. Bot.* p. 126. *Endl. 3rd Suppl.* p. 43.

CHONDRIA pinnatifida, *Ag. Sp. Alg.* vol. i. p. 337. *Syst.* p. 201. *Hook. Fl. Scot.* part. 2. p. 105. *Grev. Fl. Edin.* p. 291. *Kütz. Phyc. Gen.* p. 437.

GELIDIUM pinnatifidum, *Lyngb. Dan.* p. 40. t. 9.

FUCUS pinnatifidus, *Gm. Linn. Syst. Nat.* p. 1385. *Huds. Fl. Ang.* p. 581. *Lightf. Fl. Scot.* p. 953. *Stack. Ner. Brit.* p. 48. t. 11. *Turn. Syn.* vol. 2. p. 267. *Hist.* t. 20. *E. Bot.* t. 1202.

FUCUS multifidus, *Huds. Fl. Ang.* p. 581.

Var. β, *Osmunda*; frond flat, generally undivided; ramuli short, and multifid.

FUCUS pinnatifidus, β. Osmunda, *Turn. Syst. l. c. Hist.* t. 20.

FUCUS Osmunda, *Gm. Linn. Syst.* p. 1385. *Gm. Hist. Fuc.* p. 155. t. 16. f. 2. *Stack. Ner. Brit.* p. 46. t. 11.

FUCUS filicinus, *Lightf. Fl. Scot.* p. 954. (*Excl. Syn. Huds.*).

Var. γ, *angusta*; frond roundish; ramuli cylindrical, elongated, very erect, slightly thickened upwards.

FUCUS pinnatifidus, γ, angustus. *Turn. l. c.*

Var. δ, *tenuissima*; frond flat, of small size; ramuli very slender and much branched, the branches divaricated.

FUCUS pinnatifidus, δ, tenuissimus, *Turn. l. c.*

Var. ε, *littoralis*; dwarf, greenish olive; frond flat, broad, tapering to the base; ramuli short, emarginate, bearing cup-like bodies filled with "antheridia." (?)

HAB. On submarine rocks from the extreme of high water mark, to beyond the limit of low water. Abundant on the British coasts.

GEOGR. DISTR. On the shores of the Atlantic, Pacific, Indian and Southern Oceans, abundantly. Mediterranean Sea. Red Sea.

DESCR. *Root* a disc, accompanied by fibres. *Fronds* tufted, 1–12 inches high or more, from half a line to two or three lines in width, flattish, compressed or subcylindrical; the main stem undivided, or parted into two or three

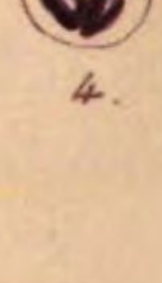
principal segments, furnished throughout with alternate, distichous branches of various lengths, closely placed, with rounded axils. The smaller *branches* are pinnatifid, the larger bi- or even tri-pinnatifid; the ultimate branchlets obtuse. In γ, the frond is nearly cylindrical, 4–6 inches long, about half a line in diameter, of nearly equal breadth throughout, with a simple stem, furnished with branches gradually decreasing in length upwards, so that the outline is conical. These branches are not strictly distichous, and their ramuli, which are long, simple and very erect, are frequently inserted on all sides of the pinnæ. δ, is one or two inches high, a line in width, tapering greatly to the base, bare of ramuli below, more or less pinnatifid or bi-pinnatifid above, the ultimate laciniæ short. This variety almost always produces in the tips of its ramuli urn-shaped or cup-shaped bodies (fig. 3. 4.), filled with branching, gelatinous, yellow filaments, the apex of one of which is represented at fig. 6, composed of minute cellules lying loosely together, with a row of larger cells running through the centre, and others resembling drops of oil at their tips. *Fructification*; 1, ovate capsules, seated on the ramuli, containing a tuft of pear-shaped spores; 2. triparted tetraspores, immersed in the surface cells of the ramuli. *Colour* varying, according as the plant grows in places exposed to the sun, or the contrary, from pale yellow, to greenish olive, olive-brown, and lurid-purple. *Substance* cartilaginous.

Few of the marine Algæ exhibit a greater variety of forms and sizes than the subject of this plate, which abounds on all the British shores, and is found in equal plenty along the coasts of the Atlantic, and Pacific Oceans, in the Tropical seas, and as far south as Cape Horn. It commences to grow nearly at high water mark, covering the rocks with a stunted vegetation, of a yellowish, or livid green, scarcely larger than the neighbouring *Lichina pygmæa*, and continues, increasing in luxuriance with the increasing depth of water, down to the region of the *Laminariæ*, where it reaches its highest developement, and perhaps extends to a greater depth.

Among its varieties, the var. γ, *angusta*, has most the look of a distinct species, and sometimes closely resembles *L. obtusa*, but from that really distinct species it may be known by its colour, the more erect, alternate ramuli, and by its place of growth; *L. obtusa* being a parasitic plant. This variety is chiefly found on loose stones, in gravelly places, and where fresh water runs into the sea.

Laurencia pinnatifida has often, though not invariably, a hot and biting taste, and was formerly eaten in Scotland under the name of Pepper Dulse. It does not appear to have ever been in much repute, as an article of food, and its use is now rare.

Fig. 1. LAURENCIA PINNATIFIDA, the normal condition. 2. The variety ϵ:— *both of the natural size.* 3. An urn-shaped, and 4, a cup-shaped body from the tips of var. ϵ. 5. One of these laid open. 6. Part of a filament from the same. 7. Ramulus with capsules. 8. Tuft of spores. 9. Tetraspores in the ramuli. 10. A tetraspore. 11. Longitudinal section of the stem.



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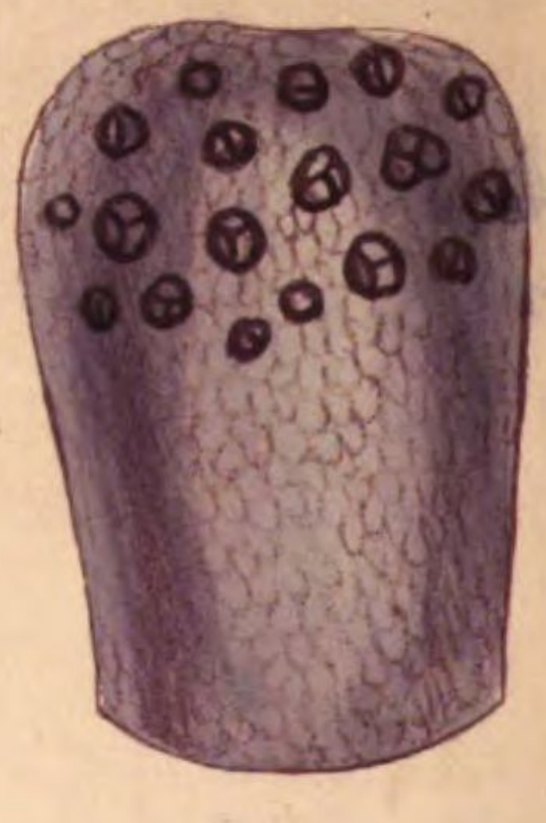

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W. H. H. del et lith.

R. B. & R. imp.

PLATE CCLXXXVI.

LAURENCIA CÆSPITOSA, *Lamour.*

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*),—in honour of M. de la Laurencie, a French naturalist.

LAURENCIA *cæspitosa*; frond cylindrical or subcompressed, narrow, repeatedly pinnate, pyramidal; main branches often opposite, erecto-patent; ramuli irregularly scattered, distichous or spreading on all sides, often crowded, erect, slightly tapering to the base, truncate.

LAURENCIA cæspitosa, *Lamour. Ess.* p. 43. *Mont. Pl. Crypt. Canar.* p. 154. *Harv. Man.* ed. 2. p. 98.

LAURENCIA hybrida, *Lenorm. in Dub. Bot. Gall.* p. 951. *Harv. Phyc. Br.* vol. i. p. xiii.

LAURENCIA pinnatifida, γ angusta, *Grev. Alg. Brit.* p. 109. *Hook. Br. Fl.* vol. ii. p. 296. *Harv. Man.* p. 69. *Harv. Phyc. Brit.* pl. 55. *Wyatt, Alg. Danm.* no. 162.

FUCUS hybridus, *D.C. Fl. Fr.* vol. ii. p. 30.

HAB. On stones and shells, within tide-marks; rarely growing on other small Algæ. Annual. Summer. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic shores of Europe. Canary Islands. Southern Ocean.

DESCR. *Root* accompanied by creeping fibres. *Fronds* densely tufted, from two to six inches in length, about half a line in diameter, of nearly equal breadth throughout, cylindrical, or very slightly compressed, having a percurrent undivided stem, set with numerous, alternate, or rarely opposite, erecto-patent branches, the lowermost of which are longest, the upper gradually shorter, so that the whole plant has a pyramidal or conical outline. *Branches* repeatedly pinnated, their divisions naked at base, pinnated for three-fourths of their length, all the divisions very erect, blunt, or truncate, each ultimate ramulus frequently bi-trifid at the point. *Ceramidia* . . . ? *Tetraspores* confined to the apices of the ramuli, numerous, tripartite. *Colour*, when the plant grows under favourable circumstances, a very dark, lurid purple: when more exposed to the light, variously greenish or yellowish. *Substance* cartilaginous, becoming softer in fresh water, and then, under pressure, strongly adhering to paper.

I offer this species with some hesitation, as it has hitherto been generally considered by British authors a variety of *L. pin-*

natifida, under which species it is mentioned as *var.* γ, in our first volume. If we take ordinary specimens of *L. pinnatifida* and compare them with specimens of our present plant, they appear distinct enough; but narrow and ill-grown individuals of the former species come very close, it must be confessed, to the latter. The chief characters of our *L. cæspitosa* are a cylindrical frond, with alternate and very erect ramuli. The latter characters and the very lurid colour distinguish it from *L. obtusa*.

L. cæspitosa appears to have been first taken up as a species by Lamouroux, but was long neglected, or confounded with *L. dasyphylla*. The credit of restoring it to a place in the system is due to M. Montagne, who has given an excellent account of it in Mr. Webb's Nat. Hist. of the Canary Islands. It has a wide geographical range, and is tolerably abundant in the places where it occurs.

Fig. 1. LAURENCIA CÆSPITOSA:—*the natural size.* 2. Portion of a branch. 3. Apex of a branchlet, with tetraspores. 4. A tetraspore:—*all more or less highly magnified.*

W.H.H del et lith.

Reeve, imp.

PLATE CXLVIII.

LAURENCIA OBTUSA, *Lamour.*

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*), in honour of *M. de la Laurencie*, a French naturalist.

LAURENCIA *obtusa*; frond cylindrical, filiform, repeatedly pinnate; branches patent; pinnæ and pinnulæ mostly opposite, the ultimate pinnules very short and obtuse, sometimes cruciform.

LAURENCIA obtusa, *Lamour. Ess.* p. 42. *Duby, Bot. Gal.* p. 951. *Grev. Alg. Brit.* p. 111. *J. Ag. Alg. Medit.* p. 114. *Endl. 3rd Suppl.* p. 43. *Mont. Algier.* p. 92. *Hook. Br. Fl.* vol. ii. p. 296. *Wyatt, Alg. Danm.* no. 21. *Harv. in Mack. Fl. Hib.* part 3. p. 198. *Harv. Man.* p. 70.

LAURENCIA intricata, *Lamx. Ess.* p. 43. t. 3. f. 8, 9.

LAURENCIA gelatinosa, *Lamx. sec. Ag.*

LAURENCIA lutea, *Lamx. sec. Ag.*

LAURENCIA cyanosperma, *Lamx. Ess.* p. 43.

CHONDRIA obtusa, *Ag. Sp. Alg.* vol. i. p. 340. *Syst.* p. 202. *Hook. Fl. Scot.* part 2. p. 105. *Grev. Fl. Edin.* p. 290. *Spr. Syst. Veg.* vol. iv. p. 341. *Kütz. Phyc. Gen.* p. 437.

FUCUS obtusus, *Huds. Fl. Ang.* p. 586. *Turn. Syn.* p. 43. *Turn. Hist.* t. 21. *E. Bot.* t. 1201.

HAB. Parasitical on the smaller Algæ between tide marks. Annual. Summer. Not uncommon on the shores of England and Ireland. Rare in Scotland. Frith of Forth, *Dr. Greville.* Ardrossan and Arran, *Rev. D. Landsborough.*

GEOGR. DISTR. Dispersed throughout the Atlantic and Pacific Oceans, both north and south, in temperate and subtropical latitudes. Mediterranean Sea. Mauritius.

DESCR. *Root*, a small disc, with or without accessory fibres. *Fronds* several from the same base, forming dense, globose tufts, from three to six inches long, cylindrical, of equal diameter throughout, slender, from a quarter to half a line in diameter, furnished with a simple stem, which is closely set throughout with very patent or horizontal, often opposite, lateral branches, which diminish in length from the base to the apex, so that the whole frond has a pyramidal outline. *Branches* subdistichous, or more or less quadrifarious, spirally inserted, repeatedly pinnate; pinnæ opposite, patent, the lower ones often short and multifid, the middle ones longest, lanceolate and simply or doubly pinnate, the upper gradually shorter to the tip. Ultimate *ramuli* very short, obtuse, somewhat clavate, simple, or furnished with

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W.H.H. del. et lith.

Reeve, imp.

PLATE CXLVIII.

LAURENCIA OBTUSA, *Lamour.*

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*), in honour of *M. de la Laurencie*, a French naturalist.

LAURENCIA *obtusa*; frond cylindrical, filiform, repeatedly pinnate; branches patent; pinnæ and pinnulæ mostly opposite, the ultimate pinnules very short and obtuse, sometimes cruciform.

LAURENCIA obtusa, *Lamour. Ess.* p. 42. *Duby, Bot. Gal.* p. 951. *Grev. Alg. Brit.* p. 111. *J. Ag. Alg. Medit.* p. 114. *Endl. 3rd Suppl.* p. 43. *Mont. Algier.* p. 92. *Hook. Br. Fl.* vol. ii. p. 296. *Wyatt, Alg. Danm.* no. 21. *Harv. in Mack. Fl. Hib.* part 3. p. 198. *Harv. Man.* p. 70.

LAURENCIA intricata, *Lamx. Ess.* p. 43. t. 3. f. 8, 9.

LAURENCIA gelatinosa, *Lamx. sec. Ag.*

LAURENCIA lutea, *Lamx. sec. Ag.*

LAURENCIA cyanosperma, *Lamx. Ess.* p. 43.

CHONDRIA obtusa, *Ag. Sp. Alg.* vol. i. p. 340. *Syst.* p. 202. *Hook. Fl. Scot.* part 2. p. 105. *Grev. Fl. Edin.* p. 290. *Spr. Syst. Veg.* vol. iv. p. 341. *Kütz. Phyc. Gen.* p. 437.

FUCUS obtusus, *Huds. Fl. Ang.* p. 586. *Turn. Syn.* p. 43. *Turn. Hist.* t. 21. *E. Bot.* t. 1201.

HAB. Parasitical on the smaller Algæ between tide marks. Annual. Summer. Not uncommon on the shores of England and Ireland. Rare in Scotland. Frith of Forth, *Dr. Greville.* Ardrossan and Arran, *Rev. D. Landsborough.*

GEOGR. DISTR. Dispersed throughout the Atlantic and Pacific Oceans, both north and south, in temperate and subtropical latitudes. Mediterranean Sea. Mauritius.

DESCR. *Root*, a small disc, with or without accessory fibres. *Fronds* several from the same base, forming dense, globose tufts, from three to six inches long, cylindrical, of equal diameter throughout, slender, from a quarter to half a line in diameter, furnished with a simple stem, which is closely set throughout with very patent or horizontal, often opposite, lateral branches, which diminish in length from the base to the apex, so that the whole frond has a pyramidal outline. *Branches* subdistichous, or more or less quadrifarious, spirally inserted, repeatedly pinnate; pinnæ opposite, patent, the lower ones often short and multifid, the middle ones longest, lanceolate and simply or doubly pinnate, the upper gradually shorter to the tip. Ultimate *ramuli* very short, obtuse, somewhat clavate, simple, or furnished with

two or three small processes above; sometimes compounded in the manner of a Greek cross. *Capsules* formed near the tips of the ramuli, but rarely perfect; more commonly converted into cup-shaped bodies. *Tetraspores* densely imbedded in the tips of the ramuli. *Colour* a fugitive pink, the main branches, and sometimes the whole frond, yellowish or transparent; the ramuli more fully coloured. *Substance* cartilaginous, tender and brittle, soon decaying in fresh water; closely adhering to paper in drying.

This species is as widely dispersed over the world as *L. pinnatifida*, and though not quite so variable as that plant in general appearance, nevertheless exhibits considerable varieties. This is to be expected in a plant which grows as well in subtropical as in temperate waters; and which even extends within the tropics. On our shores, except in colour, it preserves most of the characters represented in the plate; but continental specimens are often much taller in proportion to their breadth, till the pyramidal outline becomes almost as long, in proportion to its base, as an obelisc. When growing in sunny pools the whole plant often becomes pale yellow, preserving merely in the youngest ramuli a rosy hue; but in deeper water, and under the shade of leafy Algæ, all the branches are of a full red.

I believe that *Laurencia obtusa* is always, or, at least, very generally, a parasite on other Algæ; but it appears to be quite indifferent as to the species on which it grows. I have seen it on several plants of very different natures. Most commonly it is found on *Fucus serratus*, or on *Corallina officinalis*: but it also grows on *Chondrus crispus*, *Polysiphonia nigrescens*, and even on *Sphacelaria cirrhosa*.

Tetraspores are abundantly produced; but *capsules* I have rarely found perfect on British specimens. It is more usual to find the tips of the ramuli converted into those cup-shaped, open bodies, containing yellow flocculi, which are represented in our plate of *L. pinnatifida*.

Fig. 1. LAURENCIA OBTUSA; growing on *Fucus serratus*:—*of the natural size.*
2. Branch with capsules. 3. A capsule. 4. Tuft of spores from the same.
5. Branch with tetraspores. 6. A tetraspore:—*all magnified.*

Reeve Benham & Reeve, imp.

W. H. H. del. et lith.

PLATE CLII.

LAURENCIA DASYPHYLLA, *Grev.*

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds on distinct individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, tri-parted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*),—in honour of *M. de la Laurencie*, a French naturalist.

LAURENCIA *dasyphylla*; frond cylindrical, filiform, decompound-pinnate or irregularly branched; branches erecto-patent; ramuli short, club-shaped, obtuse, transversely striate, very much attenuated at the base.

LAURENCIA dasyphylla, *Grev. Alg. Brit.* p. 112. t. 14. f. 13–17. *Hook. Br. Fl.* vol. ii. p. 296. *Harv. in Mack. Fl. Hib.* part 3. p. 198. *Harv. Man.* p. 70. *Wyatt, Alg. Danm.* no. 71. *J. Ag. Alg. Medit.* p. 113. *Mont. Algier.* p. 95. *Endl. 3rd Suppl.* p. 43. *Hook. fil. and Harv. in Lond. Journ. Bot.* vol. vi. p. 401.

LAURENCIA cæspitosa, *Lamour. Ess.* p. 43. *fide Ag.*

CHONDRIA dasyphylla, *Ag. Sp. Alg.* vol. i. p. 350. *Ag. Syst.* p. 205. *Spreng. Syst. Veg.* vol. iv. p. 342. *Kütz. Phyc. Gen.* p. 436. t. 55. f. 2.

GIGARTINA dasyphylla, *Lamour. Ess.* p. 48.

FUCUS dasyphyllus, *Woodw. in Linn. Trans.* vol. ii. p. 239. t. 21. *Turn. Syn.* p. 38. *Turn. Hist.* t. 22. *Sm. E. Bot.* t. 847.

β. *squarrosa*; tufts intricate; fronds irregularly branched; the branches arched, and more or less recurved; ramuli frequently attenuated at the apex.

HAB. On stones and shells in pools, near low-water mark, generally where the surface is covered with sand or mud. β. dredged in 4–5 fathoms water. Annual. Summer. Frequent, on the shores of Great Britain, Ireland, and the Channel Islands. β. in Plymouth Sound, *Rev. W. S. Hore*.

GEOGR. DISTR. Atlantic shores of Europe and America. Mediterranean and Baltic Sea. West Indies, *Agardh*. Tasmania, *Mr. Gunn*. Cape of Good Hope, *Herb. Mertens*.

DESCR. *Root* accompanied by creeping fibres. *Fronds* several from the same base, from four to twelve inches long, or more, half a line in diameter, cylindrical, generally with an undivided, or once forked principal stem, closely set with lateral branches, the lowermost of which are longest, the rest gradually lessening upwards, so that the outline is pyramidal. *Branches* either alternate, or opposite, or two or three consecutively from the same side of the stem, more or less quadrifarious, erecto-patent, bearing a second or third series of similar, but smaller branches; the last of which are furnished with short patent, club-shaped, obtuse ramuli, from one to four lines in length, and very much attenuated at their insertion. Sometimes the branching is very dense and bushy, at other times the main branches are

few, distant, and little divided. All the young branches and ramuli are transversely striate, as if jointed, owing to a peculiar arrangement of the cells of the axis. *Fructification*; ovate *capsules* or *ceramidia*, sessile on the smaller branches, containing a tuft of pear-shaped spores; 2, *tetraspores* immersed in the ramuli. *Substance* cartilaginous, soon decomposing and becoming gelatinous, and closely adhering to paper in drying. *Colour* varying from a dark purple to a pale pink, or even yellowish, according to exposure.

Laurencia dasyphylla belongs to a section of the genus distinguished by having a jointed axis, composed of four or five large cells surrounding a central cavity, exactly as in *Rytiphlæa*; and as these cells are all of equal length, their upper and lower extremities form transverse lines, which, seen through the minute cells of the surface, have the appearance of striæ. In the present species these striæ are at very short intervals. They are much more apparent in the younger parts of the frond, but the structure on which they depend is equally obvious, on dissection, in all parts.

Our variety β., from its long, almost naked, arching stems, recurved branches, and ramuli lengthened out into a fine, or almost cirrhose point, with the occasional interspersion of setaceous processes, has a very peculiar aspect, and may appear, on a hasty inspection, to be a distinct species; or to a person unacquainted with *L. tenuissima*, it may possibly be mistaken for that plant. But a more careful examination shows it to be perfectly analogous to the squarrose variety of *Chylocladia kaliformis*, and as both plants are found in similar situations, their peculiar characters probably depend on local causes acting similarly upon them. In the variety now under review, it rarely, if ever, happens that *all* the ramuli are drawn into long points, or *all* the branches arched and recurved; but the majority are in these conditions.

It will be seen that the geographical distribution of this species is very extensive. I have received it from many distant quarters, both of the Northern and Southern Hemispheres, but have not gathered it at the Cape of Good Hope, whence it appears to have been sent to Prof. Mertens. There is, however, a Cape species figured in my NEREIS AUSTRALIS (t. 31.), which somewhat resembles it, but is truly distinct.

Fig. 1. LAURENCIA DASYPHYLLA:—*of the natural size.* 2. Apex of a branch, with tetraspores. 3. Tetraspores. 4. Apex with capsules. 5. A capsule. 6. Tuft of spores from the same. 7. Transverse seition of the frond. 8. Longitudinal section:—*all more or less magnified.*

H. del et lith.

Reeve Benham & Reeve imp

PLATE CXCVIII.

LAURENCIA TENUISSIMA, *Grev.*

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*), —in honour of M. de la Laurencie, a French naturalist.

LAURENCIA *tenuissima*; frond filiform, terete, irregularly divided; branches long and virgate, clothed with very slender, setaceous ramuli, which taper to the base and apex.

LAURENCIA tenuissima, *Grev. Alg. Brit.* p. 113. *Hook. Br. Fl.* vol. ii. p. 296. *Wyatt, Alg. Danm.* no. 22. *Harv. Man.* p. 70. *Harv. in Hook. Lond. Journ. Bot.* vol. vi. p. 401. *Endl. 3rd Suppl.* p. 43. *J. Ag. Alg. Medit.* p. 113. *Harv. in Mack. Fl. Hib.* part 3. p. 198.

ALSIDIUM tenuissimum, *Kütz. Phyc. Gen.* p. 434. t. 55. f. 1.

CHONDRIA tenuissima, *Ag. Sp. Alg.* vol. i. p. 352. *Ag. Syst.* p. 205. *Spreng. Syst. Veg.* vol. iv. p. 340.

GIGARTINA tenuissima, *Lamour. Ess.* p. 48.

FUCUS tenuissimus, *Good. and Woodw. Linn. Trans.* vol. iii. p. 215. t. 9. *Turn. Syn.* p. 35. *Turn. Hist.* t. 100. *E. Bot.* t. 1882.

HAB. On rocks and stones between tide marks; generally in shallow pools, about half-tide level. Annual. Summer. Very rare. Weymouth, *Goodenough* and *Woodward*. Isle of Wight, *Rev. G. R. Leathes*. Torbay, *Mrs. Griffiths*. Bovisand, *Rev. W. S. Hore*. Ballycotton, Co. Cork, *Miss Ball*. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean and Black Seas. East coast of North America. Tasmania.

DESCR. *Root* accompanied by interwoven fibres. *Fronds* densely tufted, from six to eight or ten inches long, half a line in diameter below, attenuated upwards. *Stem* either simple or divided into four or five principal portions, each of which is furnished with closely-set, slender, alternate, virgate, erecto-patent, undivided branches, which sometimes bear a second set of similar, but smaller branches; the whole frond, or its principal divisions having a pyramidal outline. *Branches* slender, tapering to the base and apex, more or less densely clothed with setaceous ramuli. *Ramuli* simple, two to four lines long, straight, or somewhat curved at base, and tapering to the apex, quadrifarious, irregularly inserted, either scattered or rarely somewhat fascicled. Occasionally, in luxuriant specimens, the ramuli bear a few of a second order. *Capsules* ovate, subsessile, borne profusely on the sides of the ramuli, containing a tuft of pear-shaped spores. *Tetraspores* contained in the ramuli, globose, scattered. A transverse section of the stem shows six cells of large size surrounding the central one, with a wide border of smaller cells. *Substance* between cartilaginous and gelatinous,

tender, closely adhering to paper, with a slight gloss, when dry. *Colour* when growing in the shade, a pale pinkish-purple, soon fading, on exposure to sunshine, to a yellowish or greenish hue.

This is by much the most slender and delicate, as it is also the rarest, of the British species of *Laurencia*. Hitherto it has only been found on the most southern shores of England and Ireland, and this is probably the northern range of the species, as it is not known on the continent of Europe, to the north of France; and the American specimens which have reached me are chiefly from the coasts of Carolina and Florida. In Europe it is most abundant in the Mediterranean Sea. Several stations are noticed on the south coast of England, and wherever it grows it is generally found in tolerable abundance, forming dense tufts, many of which will often be found in the same pool. The favourite locality is in very shallow tide pools, fully exposed to the sun, and frequently situated but a short distance below high-water mark: thus clearly showing a partiality for warmth which marks the straggler from warmer latitudes. In such situations it frequently becomes much discoloured, the purple hue, which is natural to it, being exchanged for a greenish-yellow, at the same time that the cellular substance is much softened.

I have received fine specimens from the shores of Tasmania, where it appears to be not uncommon.

By Professor Kützing this species is referred to the genus *Alsidium*, one of the *Rhodomeleæ*; but I think few persons who have carefully studied the species of *Laurencia* in a living state can doubt its close affinity with the other individuals of that group. Indeed some specimens of *L. dasyphylla* approach it so nearly that it requires a pretty close examination to distinguish them from strong-growing individuals of *L. tenuissima*. The *L. striolata* of the Mediterranean seems scarcely distinct.

Fig. 1. LAURENCIA TENUISSIMA :—*of the natural size.* 2. Portion of a branch, with tetraspores in the ramuli. 3. Fertile ramulus. 4. Tetraspores from the same. 5. Apex of a branch, with *ceramidia*. 6. A ceramidium. 7. Spores from the same. 8. Transverse section of the frond.

1.

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3.

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5.

6.

7.

W. H. del. et Lith.

Kronheim

PLATE CXIV.

CHRYSYMENIA CLAVELLOSA, *J. Ag.*

GEN. CHAR. *Frond* tubular, continuous (not constricted or jointed), filled with a watery juice, and traversed by few longitudinal filaments; its walls composed of several rows of cells, the innermost of which are distended and much elongated, the outer gradually smaller, and the ultimate very minute. *Fructification* of two kinds, on distinct individuals; 1, ovate or conical *capsules (ceramidia)* containing a dense mass of angular spores, fixed to a central placenta. 2, triparted *tetraspores* immersed in the ramuli. CHRYSYMENIA (*J. Ag.*),—from χρυσεος, *golden*, and 'υμην, a *membrane*; because the species acquire golden tints if long steeped in fresh water.

CHRYSYMENIA *clavellosa*; frond gelatino-membranaceous, very much branched in a repeatedly pinnate manner, branches of various lengths, mostly distichous; ramuli distichous or quadrifarious, attenuated at base; capsules conical.

CHRYSYMENIA clavellosa, *J. Ag. Medit.* p. 107. *Endl. 3rd Suppl.* p. 42.

CHONDROTHAMNION clavellosum, *Kütz. Phyc. Gen.* p. 438. t. 53. f. 2.

CHONDROTHAMNION confertum, *De Not.*

CHYLOCLADIA clavellosa, *Hook. Br. Fl.* vol. ii. p. 297. *Wyatt, Alg. Danm.* no. 23. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 71.

GASTRIDIUM clavellosum, *Lyngb. Hyd. Dan.* p. 70. t. 17. *Grev. Alg. Brit.* p. 115.

GASTRIDIUM purpurascens, *Lyngb. l. c.* p. 69. t. 17.

CHONDRIA clavellosa, *Ag. Sp. Alg.* vol. i. p. 353. *Ag. Syst.* p. 206. *Hook. Fl. Scot.* part 2. p. 105. *Grev. Fl. Edin.* p. 291. *Spreng. Syst. Veg.* vol. iv. p. 342.

GIGARTINA clavellosa, *Lamour. Ess.* p. 49.

FUCUS clavellosus, *Turn. in Linn. Trans.* vol. vi. p. 133. t. 9. *Turn. Syn.* p. 373. *Turn. Hist. Fuc.* t. 30. *Sm. Eng. Bot.* t. 1203.

HAB. On rocks, stones, and parasitical on the smaller Algæ near low-water mark; also on the stems of *Laminariæ*, at a greater depth. Annual. Spring and summer. Found on all the British coasts from Orkney to Cornwall. Jersey.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to Spain. Baltic Sea. Mediterranean Sea. Tasmania.

DESCR. *Root* a minute conical disc. *Fronds* from three to twelve or fourteen inches long, from a quarter of a line to nearly two lines in diameter, with a generally undivided principal stem, which gradually widens from the base to the middle, and then tapers towards the apex. This stem is closely beset from a short distance above its base to its extremity, with lateral, patent, opposite or alternate, generally distichous branches, of very various lengths, and having a lanceolate outline, which are in like manner pinnated with a second, third or even fourth series of smaller branches or ramuli, the last of which are from one to two or three lines long, spindle-shaped, and subacute. Always when young, and very generally in all stages, the ramuli are, like the other parts of the frond, distichous; but sometimes they are

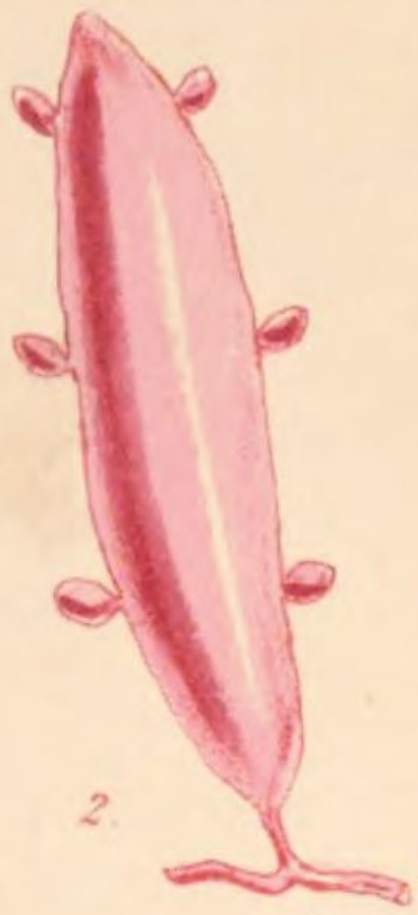
excessively crowded, much divided, and issuing from all sides of the branches. In some varieties the main stem is nearly naked, with a few very long virgate branches, much longer than itself, which are clothed with slightly compound ramuli, half an inch long; in others the main branches and their divisions are so densely crowded, so excessively compound, and so frequently quadrifarious, that the whole frond becomes a matted ball, so dense that it is difficult to trace its branching. *Substance* tender, soon decomposing in fresh water. *Colour* a beautiful pinky red, which becomes rather darker in drying.

Chrysymenia clavellosa was first described by Mr. Turner, in the sixth volume of the 'Linnæan Transactions', where a figure is given, but was known, as this author informs us, to the excellent Lightfoot, who proposed to describe it under the specific name bestowed upon it by Mr. Turner. It also appears to have been in some respects known to Hudson, in whose herbarium specimens are preserved. But previously to the publication of Mr. Turner's memoir, it was very commonly regarded as a state of *Chylocladia kaliformis*, a plant of a different structure, and different ramification.

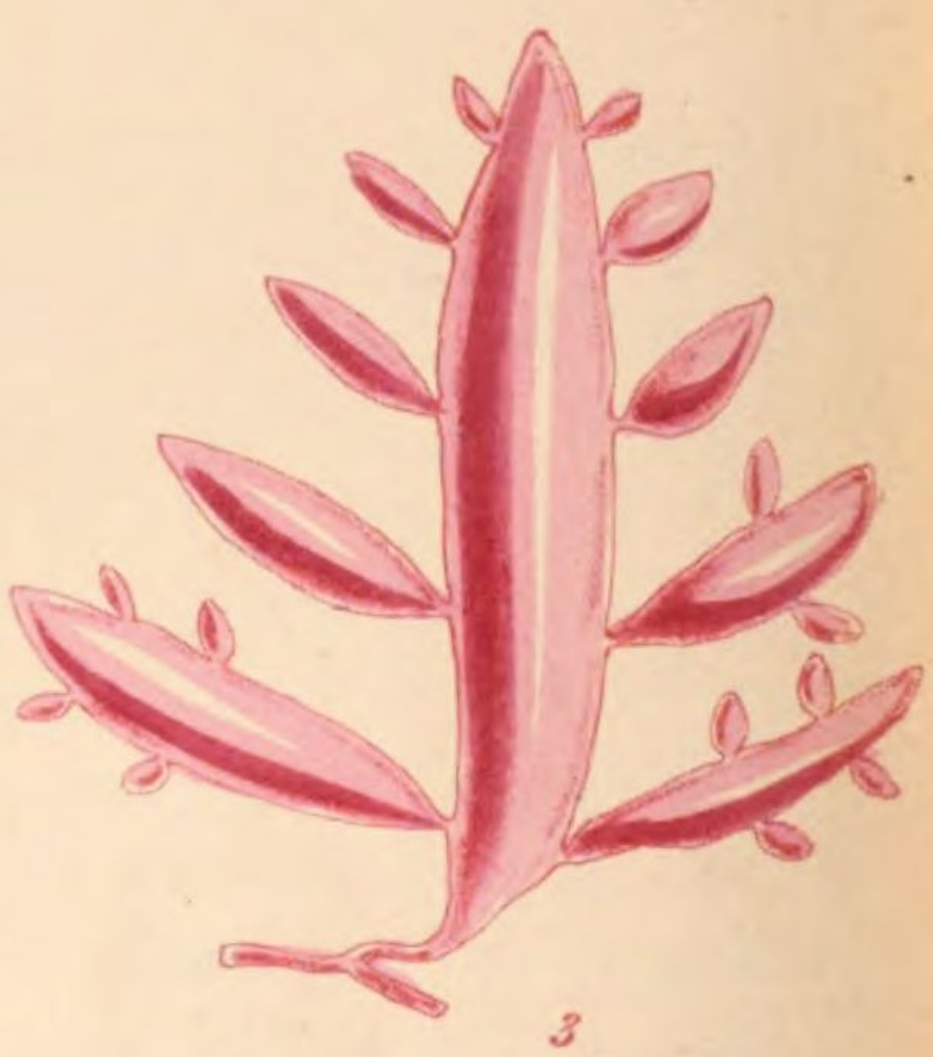
By the younger Agardh it is made the type of a new genus, to which several exotic species are also referable, distinguished from *Chylocladia*, under which Dr. Greville included this group, by the absence of internal diaphragms dividing the branches of the frond into distinct joints. This character is accompanied by some difference in habit, and some minor details of structure, and may be admitted as sufficient. But I cannot so readily concur with my friend Agardh in removing *Chrysymenia* from the *Chondrieæ* to the *Coccocarpeæ*. The nature of the fructification, and, as it appears to me, the whole structure of the frond are those of *Chondrieæ*. In *Chrysymenia*, indeed, the *ceramidia* are even more perfectly formed than in some species of *Chylocladia*.

A specimen of *Chondrothamnion confertum*, De Not., communicated by M. Lenormand, is certainly nothing more than a young and densely branched individual of the present species, such as one commonly finds in spring or early summer. It is a pity that the founders of new species are not always sufficiently careful to observe the changes which these plants undergo at different seasons, and the modifications to which they are subject from circumstances attending their production.

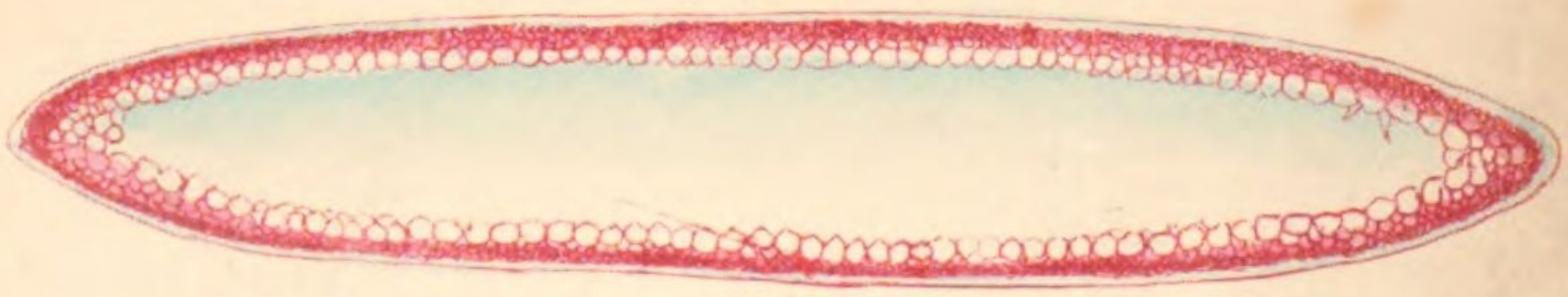
Fig. 1. CHRYSYMENIA CLAVELLOSA:—*of the natural size.* 2. A small branch, bearing capsules. 3. A section of a ramulus, with its capsule. 4. A ramulus with tetraspores. 5. Tetraspores. 6. A longitudinal section of the wall of the frond. 7. A transverse section of the same:—*all more or less magnified.*



2.



3



4.

W.H.H. del et lith.

F. Reeve, imp.

PLATE CCCI.

CHRYSYMENIA ROSEA,

Var. ORCADENSIS, *Harv.*

GEN. CHAR. *Frond* tubular, continuous (not constricted or jointed), filled with a watery juice, and traversed by a few longitudinal filaments; its walls composed of several rows of cells, the innermost of which are distended and much elongated, the outer gradually smaller, and the superficial ones very minute. *Fructification*: 1, *ceramidia*, containing a very dense tuft of angular spores; 2, triparted *tetraspores*, immersed in the ramuli. CHRYSYMENIA (*J. Ag.*),—from χρυσεος, *golden*, and ὑμην, a *membrane*; because the species assume golden tints if steeped for some time in fresh water.

CHRYSYMENIA *rosea*, var. *Orcadensis*; fronds distichous, pinnate, or bipinnate, the main stem and the pinnæ and pinnules elliptic-oblong, compressed; pinnæ opposite.

CHRYSYMENIA Orcadensis, *Harv. Man.* ed. 2. p. 100.

HAB. On rocks and Algæ in deep water. Annual? At Skaill, Orkney, *Miss Watt*. On a root of *Laminaria digitata*, adhering to a large stone, dredged in eight fathoms, Sanda Frith, Orkney (growing with *Rhodymenia cristata*), *Messrs. Thomas and M'Bain*.

GEOGR. DISTR. Only known in the above localities.

DESCR. *Root* fibrous, branching. *Fronds* (in the only specimens yet seen) from three-quarters of an inch to an inch and a half in height, a quarter of an inch in breadth, compressed, undivided, oblong, rounded, or bluntly pointed, but not attenuated at the summit, once or twice pinnate with similarly-shaped frondlets. *Frondlets* opposite, at first ovate, becoming oblong as they grow, distichous. *Substance* delicately membranaceous, closely adhering to paper. *Colour* a bright rosy red, preserved in drying. *Fructification* unknown.

When the plate now given was prepared and lithographed, I was only acquainted with the few imperfect specimens first discovered, and noticed, under the provisional name "*Orcadensis*," in the recently published edition of the 'Manual'; but within the last month (August) two obliging correspondents, Mrs. Gatty

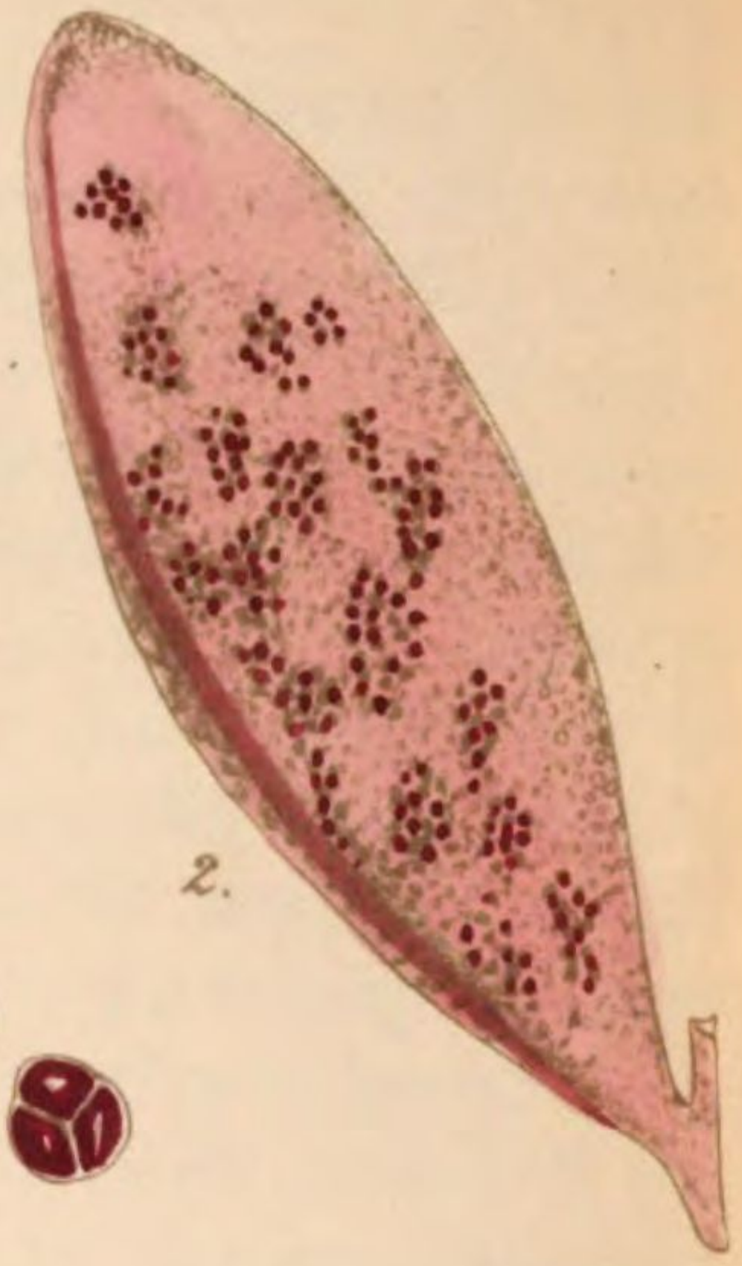
and Mrs. Hayden, have communicated more perfect specimens gathered at Filey, on the Yorkshire coast, in July 1850, which seem to connect the Orkney plant with an American species gathered at Newport, Rhode Island, to which I had previously given the name "*rosea*." The Orkney plant, here figured and described, if not a distinct species, is still so much broader than either the American or the Yorkshire plants that it may be retained as a well-marked variety. Our figure is, however, so imperfectly characteristic of the species, that another will be desirable, which we trust to give before the close of the work, and, to afford time for discovery, both to our Orkney and Yorkshire friends, shall defer it to the latest practicable period.

Mrs. Gatty's largest specimen, most kindly placed at our disposal, so nearly resembles one of the American specimens that it might have been supposed to be from the same locality; while Mrs. Hayden's in its rather broader frond approaches the Orkney form. Mere *breadth* of frond is an uncertain character: a better distinction between this species and *C. clavellosa* lies in the more elliptical and obtuse ramuli, which are greatly more constricted at the insertion. Another character is pointed out by Mrs. Gatty, whose specimen bears tetraspores,—namely, that these are collected into several distinct *sori*, not dispersed through the branchlets, or forming one general sorus.

Fig. 1. Plants of CHRYSYMENIA ROSEA, var. ORCADENSIS:—*the natural size.*
2. A young frond:—*slightly enlarged.* 3. An older frond:—*the same.*
4. Transverse section of the frond:—*highly magnified.*

A.

1.



2.

3

B.

1.

2.

3.

W. H. H. del et lith.

Reeve & Nichols, imp.

PLATE CCCLVIII. *A.*

CHRYSYMENIA ROSEA, *Harv.*

(For description see PLATE CCCI.)

I have nothing to add to the account already given of this plant under the above-quoted figure, but merely redeem my pledge by figuring one of Mrs. Gatty's Filey specimens, to contrast with the figure of the Orkney plant already given. The Filey specimen is taller, narrower in proportion, with better developed pinnæ, and is in fruit. Though narrow, in comparison to the Orkney variety, it is greatly broader than any form of *C. clavellosa* with which I am acquainted; but I have been assured by Dr. Walker Arnott that a drawing exists in the late Mr. Brodie's Herbarium, which Dr. Arnott considers identical with my *C. rosea*. I possess specimens of *C. clavellosa*, var. *sedifolia*, of Mr. Brodie's gathering, but they are very unlike the plant here figured.

A. Fig. 1. CHRYSYMENIA ROSEA:—*the natural size.* 2. A ramulus with *tetraspores*:—*magnified.* 3. Tetraspores:—*highly magnified.*

PLATE CCCLVIII. *B.*

CHYLOCLADIA KALIFORMIS, *vars. β & γ.*

(For description, &c., see PLATE CXLV.)

Under Pl. CXLV. I have characterized what I consider to be two varieties of *C. kaliformis*, but which continental correspondents have sent me as distinct species. The former, our var. *β, patens*, being the *Ch. patens*, Kütz., and the latter, *γ, squarrosa*, the *Ch. squarrosa* of the same author. As there was not room to represent these forms on Pl. CXLV., I avail myself of the present opportunity to figure them. The specimens here drawn are Irish, fig. 1 being from Carrickfergus, and fig. 3 from Roundstone; both collected by the late Mr. M'Calla.

B. Fig. 1. CHYLOCLADIA KALIFORMIS, *β* patens:—*the natural size.* 2. Ramuli:—*magnified.* 3. Ch. kaliformis, *γ* squarrosa:—*the natural size.*

W. H. H. del. et lith.

Reeve, Lan

PLATE CXVIII.

CHYLOCLADIA OVALIS, *Hook.*

GEN. CHAR. *Frond* (at least the branches) tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with a watery juice, and traversed by a few longitudinal filaments; periphery composed of small, polygonal cells. *Fructification* of two kinds on distinct individuals; 1, spherical, ovate or conical *capsules (ceramidia)* containing a tuft of wedge-shaped spores on a central placenta. 2, tripartite tetraspores, immersed in the smaller branches, near their apices. CHYLOCLADIA (*Grev.*),—from χυλὸς, *juice*, and κλάδος, a *branch*.

CHYLOCLADIA *ovalis*; frond cylindrical, solid, irregularly dichotomous, naked below, above beset with simple, elliptical, rarely elongated and jointed, tubular ramuli; capsules spherical, with a wide transparent border.

CHYLOCLADIA ovalis, *Hook. Br. Fl.* vol. ii. p. 297. *Wyatt, Alg. Danm.* no. 114. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 71.

GASTRIDIUM ovale, *Grev. Alg. Brit.* p. 116. t. 14.

GASTROCLONIUM ovale, *Kütz. Phyc. Gen.* p. 441.

LOMENTARIA ovalis, *Endl. 3rd Suppl.* p. 43.

CHONDRIA ovalis, *Ag. Sp. Alg.* vol. i. p. 348. *Ag. Syst.* p. 204. *Spreng. Syst. Veg.* p. 342.

GIGARTINA vermicularis, *Lamour. Ess.* p. 48. t. 4. f. 8, 9, 10.

FUCUS ovalis, *Huds. Fl. Ang.* p. 573. *Sm. E. Bot.* t. 711. *Turn. Syn.* t. 30. *Turn. Hist. Fuc.* t. 81.

FUCUS vermicularis, *Gm. Hist.* p. 162. t. 18. f. 4. *Lightf. Fl. Scot.* p. 958.

FUCUS sedoides, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 117. *Stack. Ner. Brit.* p. 67. t. 12.

HAB. On rocks and stones within tide marks. Annual. Spring and summer. Frequent on the southern shores of England, and on the Irish coasts. Scarborough, *Hudson*. Little Isles of Jura, *Lightfoot*. Papa Westra, *Lieut. Thomas and Dr. Mc'Bain*. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic coasts of Europe. Adriatic Sea. North-west coast of America.

DESCR. *Root* accompanied by grasping branched fibres. *Fronds* tufted, erect, from two to ten inches high, cylindrical, as thick as small twine, of nearly equal diameter throughout, irregularly dichotomous or vaguely divided, the lower half simple and mostly naked, the upper more or less closely forked, all the lesser divisions clothed with imbricated, crowded, obovate or oblong, obtuse, saccate ramuli. In some specimens these ramuli are simple, exactly elliptical, composed of a single joint, and tapering at base into a minute petiole; in others they are linear-oblong, composed of several joints,

and throw out at the dissepiments a second set of lesser ramuli. In all the main stem is solid, and densely cellular; the ramuli hollow, filled with a watery fluid. *Ceramidia* spherical, with a wide pellucid border, sessile on the sides of the ramuli. *Tetraspores* tripartite, scattered through the surface cells of the ramuli, on distinct plants. *Substance* cartilaginous in the stem; membranaceous and soft in the ramuli. *Colour*, when in vigour, a deep brownish full-red, afterwards becoming pale, then pink, and finally whitish or greenish in old age. The colour is given out by steeping in fresh water, and the plant adheres closely to paper, when dried with pressure.

There is some difference in habit betwen this plant and the other members of the genus *Chylocladia*, but so close an affinity in the more important points of its structure, that it appears very undesirable to separate it from them, as has been proposed by Prof. Kützing. Except in having a solid, cellular stem and branches, the hollow and jointed portions being confined to the ramuli, there is nothing to separate it from *C. kaliformis*, the type of the genus. Indeed, as Dr. Greville well remarks, the relationship between *C. ovalis* and *C. kaliformis* is very close, especially in that variety of the former, in which the ramuli are lengthened, and bear several joints, sometimes furnished with the commencement of new whorls. Both are remarkable for the wide, pellucid epidermis, which covers the whole plant, and for a peculiar modification of the *ceramidium*, which in these species resembles, in form, the fruit called *coccidium*, though the arrangement and shape of the spores are essentially the same as in more usual states of the organ.

Chylocladia ovalis, is in greater perfection in the months of April and May, at which season, on the west coast of Ireland, it forms a conspicuous feature in the marine flora, its densely tufted succulent fronds being then of a dark red colour, and produced in the greatest abundance. Two months later, its aspect is completely changed; great multitudes of the fronds have perished, and those that remain are faded in colour, with attenuated and more compound ramuli. By the end of August the plant has almost entirely disappeared.

Fig. 1. CHYLOCLADIA OVALIS:—*of the natural size.* 2. A ramulus with tetraspores. 3. Portion of the surface, with tetraspores imbedded. 4. Ramulus with ceramidia. 5. Longitudinal section of the stem. 6. Transverse semi-section of the same. 7. Longitudinal section of a ramulus, showing the diaphragms:—*all magnified.*

W.H.H. del. et lith.

Reeve imp.

PLATE CXLV.

CHYLOCLADIA KALIFORMIS, *Hook.*

GEN. CHAR. *Frond* (at least the branches) tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with a watery juice, and traversed by a few longitudinal filaments; periphery composed of small, polygonal cells. *Fructification* of two kinds, on distinct individuals; 1, spherical, ovate, or conical *capsules* (*ceramidia*) containing a tuft of wedge-shaped spores on a central placenta; 2, tripartite *tetraspores*, immersed in the smaller branches, near their apices. CHYLOCLADIA (*Grev.*)—from χυλος, *juice*, and κλαδος, a *branch*.

CHYLOCLADIA *kaliformis*; frond subgelatinous, tubular, pyramidal; main stem simple, distended, distantly constricted; branches opposite or whorled, repeatedly compound; ramuli moniliform; capsules spherical, with a pellucid border.

CHYLOCLADIA kaliformis, *Hook. Br. Fl.* vol. ii. p. 397. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 72. *Wyatt, Alg. Danm.* n. 24. *J. Ag. Alg. Medit.* p. 111.

LOMENTARIA kaliformis, *Gaill. Res.* p. 20. *Endl. 3rd Suppl.* p. 43. *Kütz. Phyc. Gen.* p. 440. t. 55. f. 3. *Zanard, Alg. Adr.* p. 97. *Mont. Fl. Alg.* p. 88.

GASTRIDIUM KALIFORME, *Lyngb. Hyd. Danm.* p. 70. *Grev. Alg. Brit.* p. 117.

CHONDRIA kaliformis, *Ag. Sp. Alg.* vol. i. p. 355. *Ag. Syst.* p. 207. *Spreng. Syst. Veg.* vol. iv. p. 342. *Hook. Fl. Scot.* part 2. p. 106.

GIGARTINA kaliformis, *Lamour. Ess.* p. 49.

FUCUS kaliformis, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 206. t. 18. *Sm. Eng. Bot.* t. 640. *Turn. Syn.* p. 377. *Turn. Hist.* t. 29.

FUCUS verticillātus, *Lightf. Fl. Scot.* p. 962. t. 31.

β. *patens*; frond flexuous, much attenuated; branches opposite, horizontal, flexuous, drawn out into long slender points; ramuli setaceous, opposite or alternate.

LOMENTARIA patens, *Kütz. Phyc. Gen.* p. 440.

γ. *squarrosa*; frond crisped and entangled, variously curved; branches densely whorled; ramuli very numerous, whorled, squarrose or arching, slender.

LOMENTARIA squarrosa, *Kütz. Phyc. Gen.* p. 440. t. 55. f. 4.

HAB. On rocks and stones in the sea, between tide marks, and in from four to fifteen fathoms water. Annual. Spring and Summer. Var. β. and γ. in deep land-locked, sandy or muddy bays. Var. β. Strangford Lough, *Mr. W. Thompson*. Carrickfergus, *Mr. M'Calla*. Var. γ. Roundstone Bay, *Mr. M'Calla*. Torbay, *Mrs. Griffiths*.

GEOGR. DISTR. Northern Atlantic. Baltic and Mediterranean Seas.

DESCR. *Root* minute, scutate. *Fronds* from six to twelve or twenty inches in length, from the thickness of a crow-quill to that of a goose-quill in diameter, rising with a simple stem, which is distended and constricted at intervals of half an inch or an inch, furnished, at each constriction, with a whorl of branches similar to itself in structure, and, in full grown specimens, several times compounded in a similar manner. The general outline is pyramidal, the lowermost branches being longest, the uppermost gradually shorter. *Branches* spreading, more regularly constricted than the stem and at shorter intervals, furnished with whorls of more or less frequently compounded ramuli, the ultimate series of which are constricted into bead-like joints, mostly about as long as broad. *Capsules* globose, without obvious pore, furnished with a wide pellucid pericarp, and containing a dense tuft of pear-shaped spores. *Tetraspores* lodged in the joints of the ramuli. *Substance* gelatinoso-membranous, closely adhering to paper in drying. *Colour* a fugitive pink or purple, often greenish or yellowish in the stem, and, when growing in shallow pools, exposed to strong light, sometimes altogether pale yellow. Var. β. is much less compound, mostly with opposite (*not whorled*) branches, which are drawn out into long, flexuous, slender points, and furnished with a few distant slender ramuli. Var. γ. is the opposite state, forming densely matted tufts, closely whorled, with more numerous branches and ramuli to each whorl, the latter patent or curved backwards.

A well-known plant, common to most of the shores of Europe, and found growing at various depths from about half-tide level to some fathoms below low water mark. Like most species which have a wide range of climate, and which grow at various depths, sometimes on rock, sometimes on sand, and sometimes on the stems of other Algæ, it is subject to very great variations both in size and in the minor details of its branching. Our figure represents what may be considered its normal state, or type of the species, being a young plant growing under favourable circumstances near low water mark. This differs very widely in appearance from either of the deep water varieties, which are briefly characterized as our vars. β. and γ.; and yet few persons who are accustomed to the different aspects which marine plants assume from local causes will be disposed to regard them as anything more than casual forms. As *cabinet species* they appear distinct enough, especially β. whose attenuated branches and almost setaceous ramuli, *opposite*, not *whorled*, seem to mark it decidedly. I have specimens of it from the Baltic and Mediterranean; the latter communicated by Professor Kützing, who regards it, as well as our var. γ., as a distinct species.

Fig. 1. CHYLOCLADIA KALIFORMIS, a small specimen:—*of the natural size.*
2. Branchlet with *capsules*. 3. A *capsule*. 4. Portion of the tuft of spores.
5. Branchlet with tetraspores. 6. A tetraspore.

PLATE XLII.

CHYLOCLADIA REFLEXA, *Lenorm.*

GEN. CHAR. *Frond* tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with watery juice, and traversed by a few longitudinal filaments; *periphery* composed of small, polygonal cellules. *Fructification* of two kinds, on distinct individuals; 1, spherical, ovate, or conical *capsules* (*ceramidia*) containing a tuft of wedge-shaped seeds, on a central placenta. 2, tripartite *tetraspores*, immersed in the smaller branches near their apices. CHYLOCLADIA (*Grev.*)—from χυλὸς, *juice*, and κλᾶδος, a *branch*.

CHYLOCLADIA *reflexa*; frond membranaceous, purple; lower branches cylindrical, slender, arched, attaching themselves by short ramuli tipped with discs; secondary branches simple, mostly secund, moniliform, spindle-shaped; ramuli few, scattered, patent or recurved.

CHYLOCLADIA reflexa, *Lenorm. Desm. Pl. Crypt.* no. 865.

LOMENTARIA reflexa, *Chauv. Alg. de Norm.*

LOMENTARIA pygmæa, *Duby. Bot. Gal.* (*excl. Syn.*)

HAB. On rocks in the sea near low-water mark. Annual. Summer. Very rare. Hagington near Ilfracombe, *Miss Amelia Griffiths*, (July 1834). Roundstone Bay, *Mr. Mc'Calla*.

GEOGR. DISTR. Coast of Normandy. North coast of Devon.

DESCR. *Root* an expanded, fleshy disc. *Frond* from two to three inches high, half a line to a line in diameter, branching from the base in an irregular manner; the lower or main branches cylindrical, scarcely constricted, slender, arched, zigzag, forming successive arcs in one direction, and furnished at the concave side of the arc with short holdfasts, tipped with discs, by means of which the frond attaches itself to neighbouring objects, in a creeping manner; the upper or secondary branches springing from the arched ones, either two or three from one point or solitary, generally unilateral, simple, spindle-shaped, moniliform, constricted at regular intervals into joints about once and a half as long as broad, the upper joints gradually shorter to the tips. *Ramuli* few, short and mostly secund, patent or recurved, sometimes but rarely binate. *Capsules* spherical, with a pellucid border, containing a very dense mass of angular seeds. *Tetraspores* abundantly produced in the tips of the branches and ramuli. *Colour* a dull purple. *Substance* membranaceous, adhering to paper.

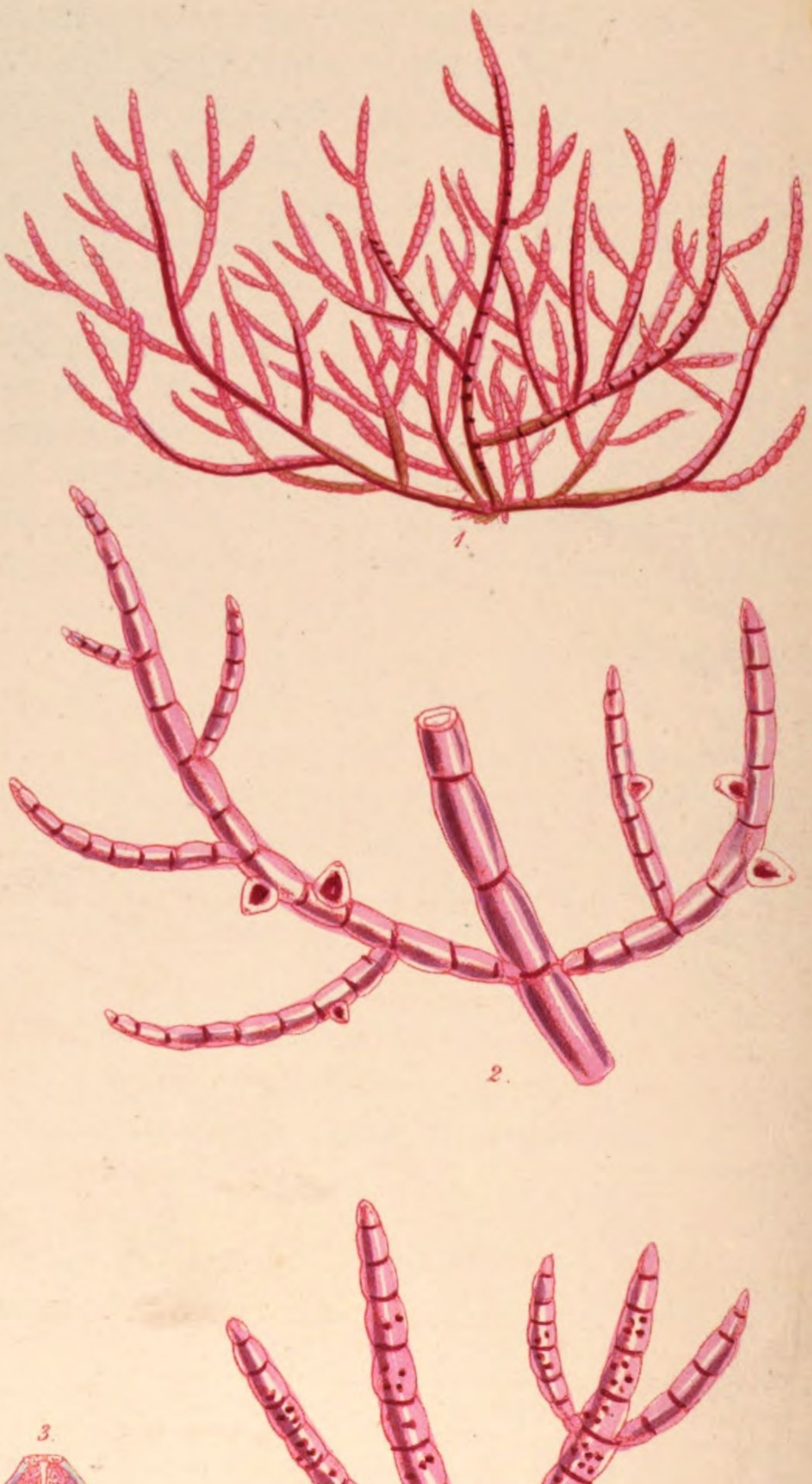
A small specimen of this interesting plant was communicated to me by Mrs. Griffiths some years ago, under the impression that it was a new species; but I delayed to describe it until

more numerous specimens, and in a more perfect state, should be discovered. I was not then aware that it was the same as a plant which occurs in several places on the coast of Normandy, and of which specimens have been since published in Desmaziere's Cryptogames of France. More lately, Mrs. Griffiths has allowed me to take a figure from specimens preserved in her Herbarium, found by Miss Amelia Griffiths at Ilfracombe; in which situation it appears to be of great rarity.

At the time the figure was made, I was not aware that a specimen found by Mr. Mc'Calla in 1840 existed in Dr. Coulter's Herbarium, among the numerous examples of *C. Kaliformis*, which I the more regret as an earlier knowledge of it would have enabled me to introduce the capsular fruit into my plate. It is abundantly covered with *capsules*, which have not been found on any of the Ilfracombe specimens.

As a species, it is, perhaps, more nearly allied to *C. Kaliformis* than to *C. parvula*, although at first sight it looks more like the latter. Its slender, main branches, and the remarkable disk-like processes by which they attach themselves at intervals, taken with the small size, irregular branching, and less gelatinous nature, offer its best distinguishing marks. The different form of the capsules affords alone a sufficient character to separate it from *C. parvula*.

Figs. 1, 2. CHYLOCLADIA REFLEXA:—*natural size.* 3. Part of the stem, with branches, and *disks*. 4. Tetraspores:—*both magnified.*



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6.

W. H. H. del. et lith.

Reeve Benham & Reeve imp.

PLATE CCX.

CHYLOCLADIA PARVULA, *Hook.*

GEN. CHAR. *Frond* (at least the branches) tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with a watery juice, and traversed by a few longitudinal filaments; periphery composed of small, polygonal cells. *Fructification* of two kinds, on distinct individuals; 1, spherical, ovate, or conical *capsules* (*ceramidia*) containing a tuft of wedge-shaped spores on a central placenta; 2, tripartite *tetraspores*, immersed in the smaller branches, near their apices. CHYLOCLADIA (*Grev.*) — from χυλος, *juice*, and κλαδος, a *branch*.

CHYLOCLADIA *parvula*; frond subgelatinous, slender, bushy, irregularly branched; ramuli scattered; branches constricted at intervals of (nearly) equal length and breadth; ceramidia conical, with a prominent orifice.

CHYLOCLADIA parvula, *Hook. Br. Fl.* vol. ii. p. 298. *Wyatt, Alg. Danm.* n. 72. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 72. *J. Ag. Alg. Medit.* p. 111.

GASTRIDIUM parvulum, *Grev. Alg. Brit.* p. 119.

LOMENTARIA parvula, *Zanard. Syn. Alg. Adr.* p. 99. *Mont. Pol. Sud. Crypt.* p. 123. *Endl. 3rd Suppl.* p. 43. *Kütz. Phyc. Gen.* p. 331.

CHONDRIA parvula, *Ag. Syst. Alg.* p. 207.

FUCUS kaliformis, *var.* γ. nanus, *Turn. Hist.* vol. i. p. 61.

HAB. Parasitical on the smaller Algæ, in tide-pools, near low water mark.

GEOGR. DISTR. Atlantic shores of Southern Europe and North America. Mediterranean Sea.

DESCR. *Root* composed of branched and matted fibres. *Fronds* three or four inches long, very densely crowded together, forming globular, intricate, bushy tufts, whose branches spread in all directions. *Stem* subsimple or irregularly forked, sometimes much divided, furnished with scattered, more or less crowded, alternate or opposite, occasionally whorled branches, as long as itself and very patent. *Branches* curved, more or less divided, and set with numerous scattered, patent or horizontal, obtuse ramuli, of nearly equal diameter with the parts they spring from. *Articulations* of the stem and main branches of uncertain length, and occasionally imperfectly defined; those of the branches and ramuli pretty constantly as long as broad, or once and a half as long, contracted at the dissepiments. *Ceramidia* prominent, sessile on the branches, ovate or conical, with a prominent orifice, and containing a dense and very darkly coloured mass of tufted, obconical spores. *Tetraspores* minute, triparted, abundantly scattered through the lesser branches and ramuli. *Colour*, a pinky or dull red, changing in fresh

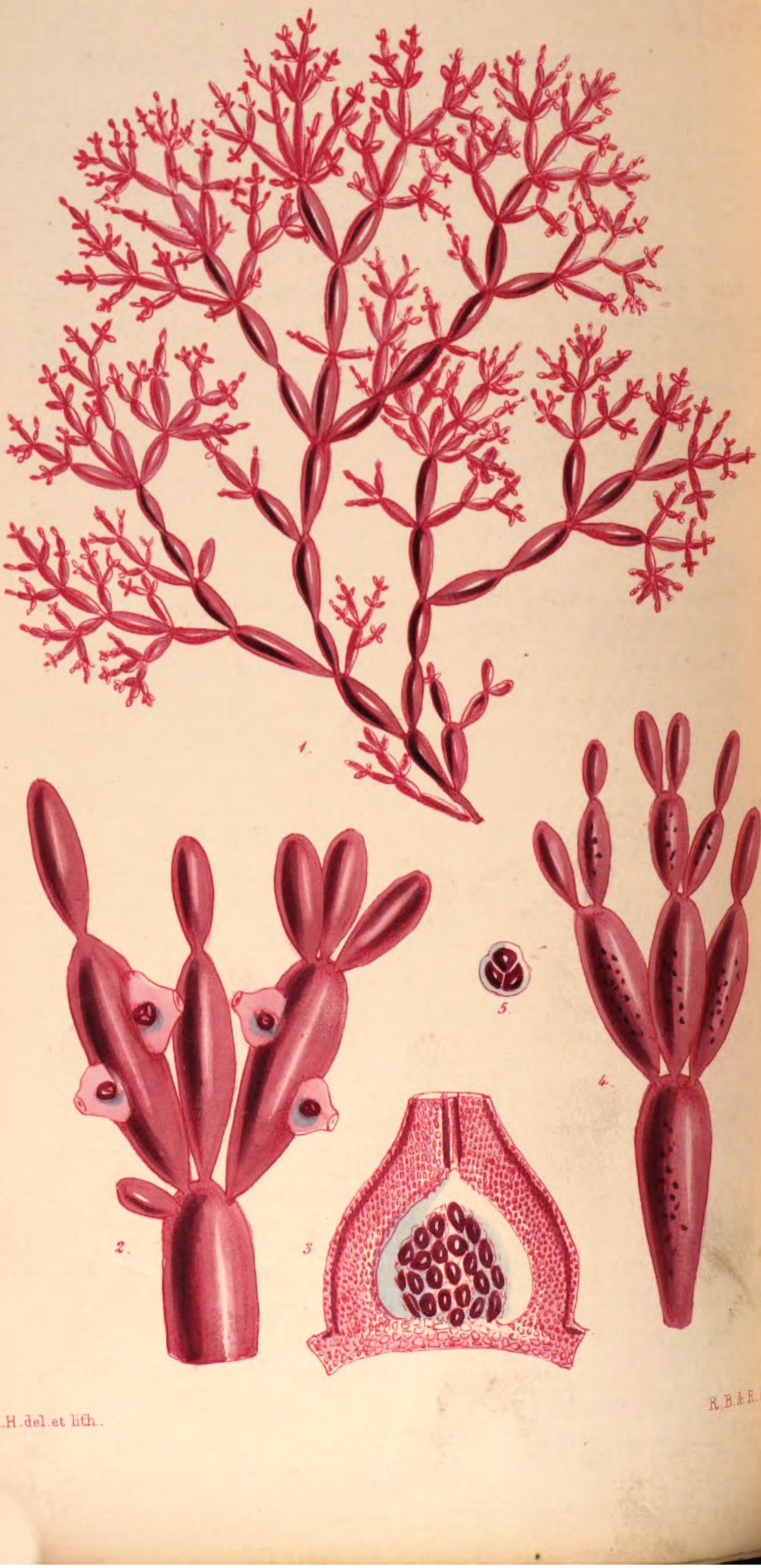
water; but when the plant grows in a sunny situation the whole frond, except the tips and the masses of spores, becomes of a greenish yellow. *Substance* gelatinous and tender, closely adhering to paper in drying.

This plant, in many of its characters, resembles the smaller specimens of *C. kaliformis*, of which it was formerly considered to be merely a dwarf variety. But it may generally be known from all states of that species by its peculiarly bushy, dense habit, and the alternate disposition of its branches and ramuli; and when found in fructification the two are clearly distinguished by the different form of the capsular fruit. The ceramidia of *C. kaliformis* are hemispherical; those of *C. parvula* are of much larger size, less abundant, and distinctly conical, with a much less evident hyaline border. In the present species also, the articulations of the branches are shorter and more equal than in *C. kaliformis*; and those of the main stems never so much distended, nor of so great a proportionate length.

Chylocladia parvula is found on most of our coasts, and appears frequent along the Atlantic and Mediterranean shores of Europe. Along the eastern shore of North America it would seem to be particularly abundant, as it occurs in almost every parcel of Algæ which I have received from that country. The American specimens agree in all essential particulars with the European; but some are much more slender, while others are more robust than the generality of British individuals. But there is quite as much difference observable among the latter as in any of the American forms.

A species found at New Zealand (*C. affinis*, Hook. et Harv.) seems almost intermediate between *C. kaliformis* and *C. parvula*, having much of the ramification of one, with the fructification of the other; but it is sufficiently distinct from both.

Fig. 1. CHYLOCLADIA PARVULA:—*the natural size.* 2. Branchlets with ceramidia. 3. Section of a *ceramidium.* 4. Spores from the same. 5. Branchlets with tetraspores. 6. A tetraspore:—*all more or less magnified.*



W.H.H. del. et lith.

R.B. & R. imp.

PLATE CCLXXXIII.

CHYLOCLADIA ARTICULATA, *Grev.*

GEN. CHAR. *Frond* (at least the branches) tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with a watery juice, and traversed by a few longitudinal filaments; periphery composed of small, polygonal cells. *Fructification*, of two kinds, on distinct individuals; 1, spherical, ovate, or conical *capsules* (*ceramidia*) containing a tuft of wedge-shaped spores on a central placenta; 2, tripartite *tetraspores*, immersed in the smaller branches, near their apices.—CHYLOCLADIA (*Grev.*),—from χυλος, *juice*, and κλαδος, a *branch*.

CHYLOCLADIA *articulata*; frond tubular, gelatinoso-membranaceous, strongly constricted throughout as if jointed, much branched, between pinnate and dichotomous, fastigiate, the upper branches often crowded; capsules obtusely conical.

CHYLOCLADIA articulata, *Grev. in Hook. Br. Fl.* vol. ii. p. 298. *Wyatt, Alg. Danm.* no. 73. *Harv. Man.* ed. 2. p. 102. *Harv. in Mack. Fl. Hib.* pt. iii. p. 200.

LOMENTARIA articulata, *Lyngb. Hyd. Dan.* p. 101. t. 30. *Endl. 3rd Suppl.* p. 43. *Kütz. Phyc. Gen.* p. 441.

CHONDRIA articulata, *Ag. Sp. Alg.* vol. i. p. 357. *Grev. Fl. Ed.* p. 291. *Spreng. Syst. Veg.* vol. iv. p. 342.

GIGARTINA articulata. *Lamour. Ess.* p. 49.

FUCUS sericeus, var. *Esper, Ic. Fuc.* vol. i. t. 82.

FUCUS articulatus, *Lightf. Fl. Scot.* p. 959. *Smith, E. Bot.* t. 1574. *Stack. Ner. Brit.* p. 28. t. 8. *Turn. Syn.* p. 383. *Turn. Hist.* t. 106.

ULVA articulata, *Huds. Fl. Ang.* p. 569.

HAB. Between tide-marks, attached to rocks and Algæ. Annual. Summer. Common.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Root* of many branching fibres matted together. *Fronds* densely tufted, six or eight to ten inches or more in length, from a quarter line to a line in diameter, tubular, filled with watery fluid and traversed by a few fibres, constricted throughout at regular intervals into joints, the lowermost of which are cylindrical, the upper gradually more elliptical, and those of the upper branches frequently beaded;—much branched from the base, the primary branching dichotomous, the secondary often opposite or somewhat pinnated, and the ramuli frequently whorled round the nodes, particularly in the upper half of the plant:—thus old tufts often become very dense and bushy above from the inordinate number of these whorled branches and

ramuli. *Apices* fastigiate, attenuate, in some varieties very much so. *Capsule* obtusely conical, scattered over the upper articulations, opening by a minute pore, the walls thick and composed of minute cells. *Tetraspores* plentifully scattered through the tissue of the articulations. *Colour* varying from a dull to a bright red, or crimson, purplish and iridescent when growing in deep water, glossy, and transparent; becoming darker when dry. *Substance* membranaceous, gelatinous within. In drying it adheres, but not strongly, to paper.

Strange to say, this plant was once regarded as a variety of *Gelidium corneum*! a blunder for which it is difficult to account, the two plants being unlike in form and substance. Stunted individuals of *Chylocladia articulata* much more closely resemble *Catenella Opuntia*, and may sometimes be mistaken for that plant, although the colour is never so lurid as it always is in the *Catenella*. An appeal to the microscope may sometimes be necessary to the young student, and then there can be no difficulty, the whole structure is so different.

Our figure represents a portion of an average-sized specimen from the west of Ireland. This plant often occurs larger—and often very much smaller and more slender. I have some curious varieties from Torquay, in which the branches are much twisted and arched, and very slender. They were matted together in crisp balls, from the excessive abundance of the upper ramuli, and could hardly be pulled asunder without tearing.

Fig. 1. CHYLOCLADIA ARTICULATA; a branch the *natural size*. 2. Small portion with capsules. 3. Section of a capsule. 4. Small portion with tetraspores. 5. A tetraspore:—*all more or less magnified*.

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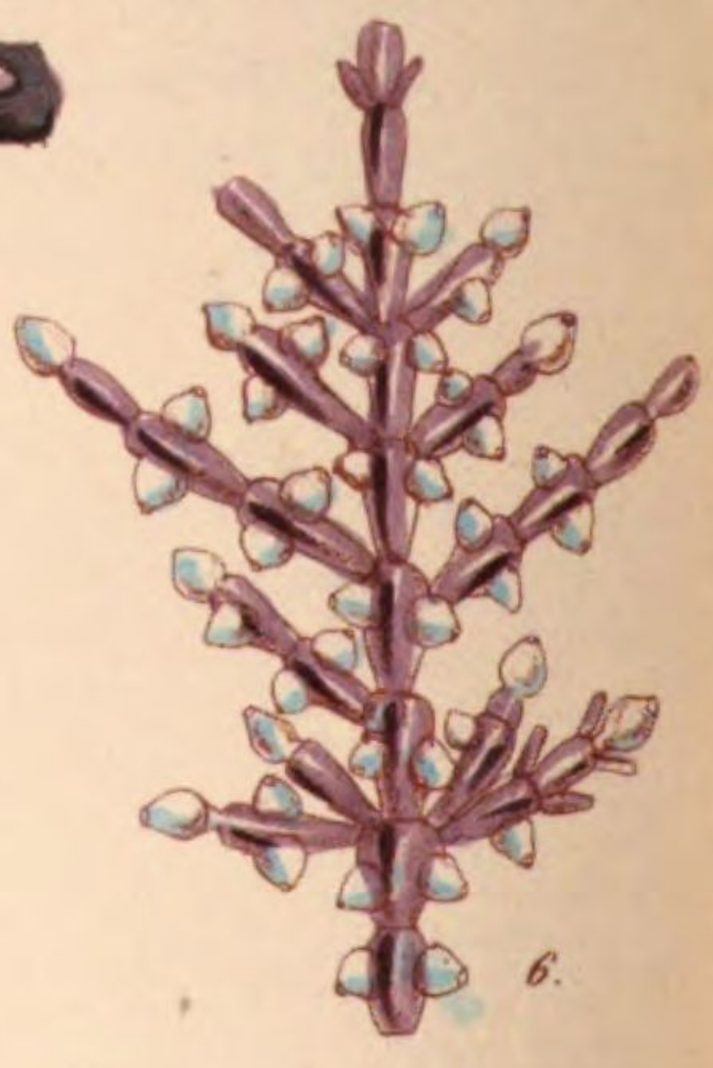

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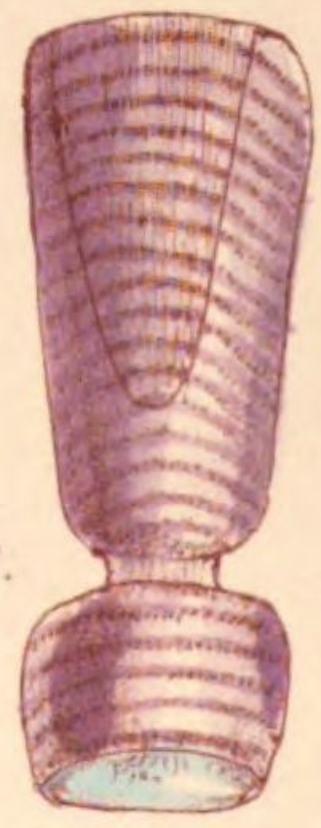

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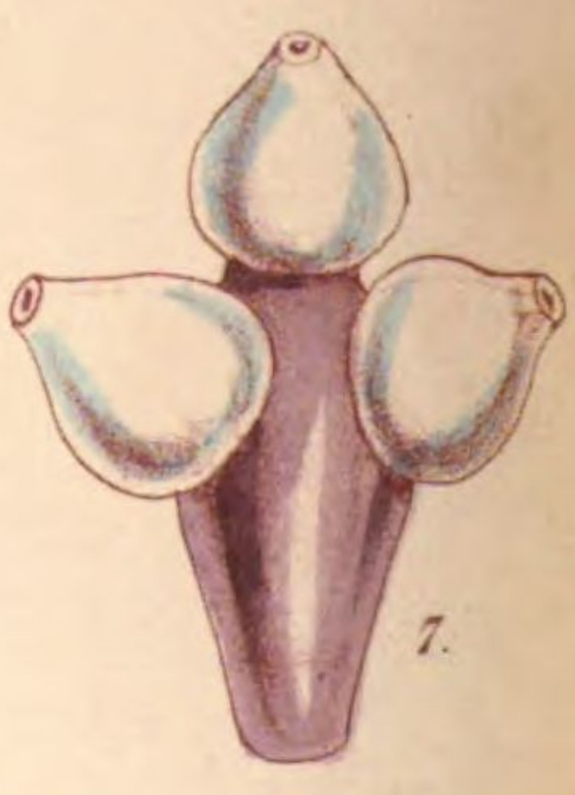


7.

W.H.H. del et lith.

R.B & R. imp

PLATE CCXXII.

CORALLINA OFFICINALIS, *Linn.*

GEN. CHAR. *Frond* filiform, articulated, branched (mostly pinnate), coated with a calcareous deposit. *Fructification*; turbinate or obovate, mostly terminal *ceramidia*, pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, or club-shaped, transversely parted tetraspores. CORALLINA (*Linn.*), — from *Coralium*, *coral*, which these plants resemble in being of a stony nature.

CORALLINA *officinalis*; decompound-pinnate; lower articulations cylindrical, twice as long as broad; upper slightly obconical, round-edged, their upper angles blunt; ultimate ramuli cylindrical, obtuse.

CORALLINA officinalis, *Syst. Ed.* x. p. 805. *Pal. Elench.* p. 422. *Ellis in Phil. Trans.* vol. 57. p. 419. t. 17. f. 12, 13. *Linn. Corresp.* vol. i. p. 201. *Soland. Zoop.* p. 118. t. 23. f. 14, 15. *Esper. Corall.* t. 3. *Berk. Syn.* vol. i. p. 211. *Jameson in Wern. Mem.* vol. i. p. 563. *Turt. Gmel.* vol. iv. p. 671. *Turt. Br. Faun.* p. 211. *Stem. Elem.* vol. ii. p. 439. *Cuv. Reg. An.* vol. iii. p. 305. *Lamour. Cor. Flex.* p. 283. *Lamour. Corall.* p. 127. *Lamk. An. S. vert.* vol. ii. p. 328. 2nd edit. vol. ii. p. 513. *Flem. Brit. An.* p. 514. *Gray, Brit. Pl.* vol. i. p. 339. *Blainv. Actinol.* p. 547. t. 96. f. 3, 3 *a*. *Johnst. Br. Sponges and Lith.* p. 216. *Decaisne, Ess.* p. 107. *Kütz. Phyc. Gen.* p. 388. t. 79. f. 1. *Endl. 3rd Suppl.* p. 48. *Mont. Fl. Alger.* p. 128.

CORALLINA anglica, *Ger. Herb.* 1572. *Merrett, Pin.* 30. *Raii, Hist.* vol. i. p. 65. *Syn.* 33. no. 1.

HAB. On rocks between tide-marks, extending throughout the whole of the litoral zone, generally growing in rock-pools. Perennial. Winter and spring. Abundant on all the rocky shores of the British Islands.

GEOGR. DISTR. Throughout the northern Atlantic Ocean and in the Mediterranean Sea. (Extra-European habitats require investigation.)

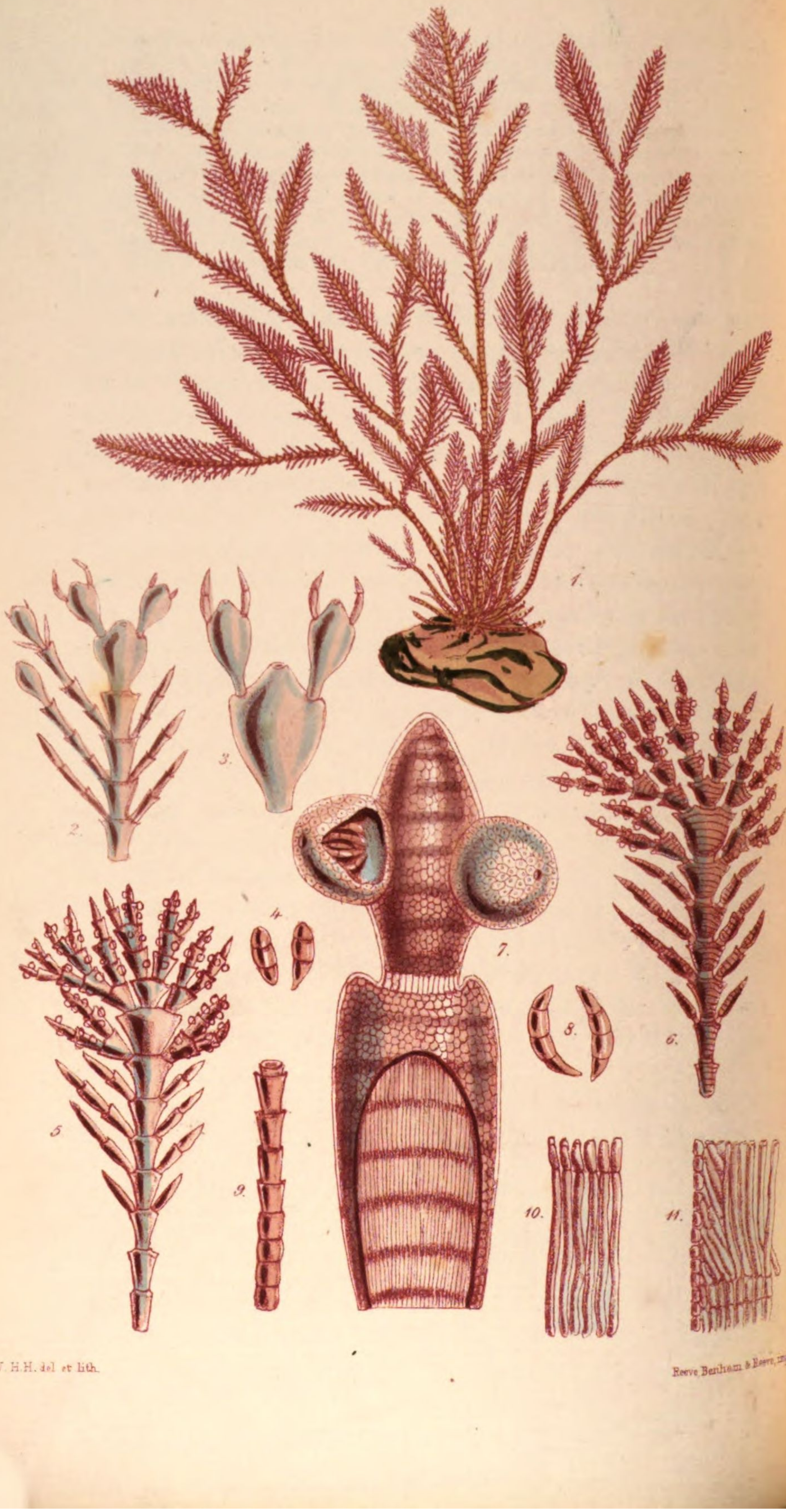
DESCR. *Root*, a widely spreading, calcareous crust. *Fronds* from one to six inches high, twice as thick as hog's bristle, congregated in dense tufts, or spreading in continuous patches over a wide surface of rock, varying much in ramification and general aspect, according to the depth at which vegetation takes place. Well-grown specimens are 4–6 inches high, more or less regularly pinnate, or bi-tripinnate; the pinnæ sometimes rising, in opposite pairs, from every joint; in others several joints intervene between each pair of pinnæ, or one pinna is wholly suppressed. Various irregularities in branching take place from suppression, and some specimens are thus reduced to long naked, alternate or spuriously dichotomous branches; while others are regularly feathered throughout. *Ramuli* slender, cylindrical, obtuse, composed of joints three or four times as long as broad. *Articulations* in the lower part of the stem cylindrical, about twice as long as broad, or somewhat shorter: those of the upper branches more or less pear-shaped or obconical, gradually swelling from the base upwards, slightly compressed, but rounded at the edges, and having the upper angles very obtuse, and not prominent. When the calcareous matter is removed by acid, the surface

appears transversely striate. *Conceptacles* of two kinds: 1, ovate *ceramidia*, pierced with a minute pore, and containing a tuft of transversely parted oblong, tetraspores; these terminate the branches and ramuli, and are of a pearly white colour. 2, slightly urceolate or mamillæform ceramidia of smaller size, springing irregularly from various parts of the articulations, and sometimes so densely crowded as to cover the whole articulation. These probably also contain tetraspores, but those which I examined were empty. The structure is similar to that of *C. squamata*. *Colour*, when growing in deep water or in shade, a dull, and rather dark purple; under sunlight passing through various shades of dull red and yellow to a milk white, which is the common colour of specimens cast on the beach.

This species is abundant on the shores of all countries within the temperate zone of the northern Atlantic, and perhaps it would not be too much to include distant regions of the Southern Ocean and the Pacific, among its habitats. Authors, however, have given distinct names to specimens coming from the south; and too much uncertainty prevails among the exotic species of the genus *Corallina* to allow of our attempting, in the present place, a reconciliation of synonymes. Even on our own shores this plant puts on so many sportive appearances, that it would be easy to form from its varieties numerous species, as distinct as some that have been founded on single fragments coming from abroad. *Colour* has been assumed as a character in describing these plants. Nevertheless it is notorious that the colours of all Corallines are remarkably fugacious, and that all quickly bleach, under the influence of the weather, to a milky whiteness. The *form* of the joints, almost the only tangible character, is subject to very wild variations, so that it is almost impossible, without a very full suite of specimens, to fix the limits of any of these plants. Our figure represents what may be regarded as the normal form of *C. officinalis*, but this is very unlike the stunted variety which occurs near high-water mark. In the latter, the joints are sometimes palmate, and much spread out; and altogether the plant looks so unlike its normal state that it may well be taken, as it has been, for something different.

According to Dr. Johnson, several of the *Melobesiæ* are to be regarded as merely imperfectly developed states of this Coralline.

Fig. 1. CORALLINA OFFICINALIS:—*of the natural size.* 2. Branch with *normal* ceramidia. 3. A Ceramidium. 4. The same, cut vertically. 5. A tetraspore from the same. 6. Branch with *abnormal* ceramidia. 7. Joint from the same, with three ceramidia. 8. Portion of the frond, after maceration in acids:—*all more or less magnified.*



W. H. H. del et lith.

Reeve, Benham & Reeve, imp.

PLATE CCI.

CORALLINA SQUAMATA, *Park.*

GEN. CHAR. *Frond* filiform, articulated, branched (mostly pinnate), coated with a calcareous deposit. *Fructification*; turbinate or obovate, mostly terminal *ceramidia*, pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, or club-shaped, transversely parted *tetraspores*. CORALLINA ( ),—from *Coralium, coral,* which these plants resemble in their stony nature.

CORALLINA *squamata*; decompound-pinnate; lower articulations cylindrical, scarcely longer than their breadth; upper obconical or obcordate, compressed, two-edged, their upper angles sharp and prominent; ultimate ramuli very slender, acute.

CORALLINA squamata, *Parkinson*, 1296. *Ellis, Cor. Pl.* p. 24. fig. *c. C. Ellis and Soland. Zoop.* p. 117. *Turt. Gmel.* vol. iv. p. 671. *Turt. Br. Faun.* p. 211. *Stew. Elem.* vol. ii. p. 439. *Lamour. Cor. Flex.* p. 287. *Lam. Coral.* p. 129. *Lam. An. s. Vert.* vol. ii. p. 329. *Gray, Br. Pl.* vol. i. p. 340. *Fl. Br. An.* p. 515. *Johnst. Br. Sponges and Corallines*, p. 222. *Decaisne, Ess.* p. 108, *Kütz. Phyc. Gen*, p. 388. *Endl. 3rd Suppl.* p. 48.

HAB. On submarine rocks, at the extremity of low-water mark. Perennial. Summer. South coast of England, *Ellis*, &c. Abundant at Miltown Malbay, West of Ireland, *W. H. H.* Youghal, *Miss Ball.* Jersey, *Miss Turner.*

GEOGR. DISTR. Atlantic shores of France and Spain. Canary Islands.

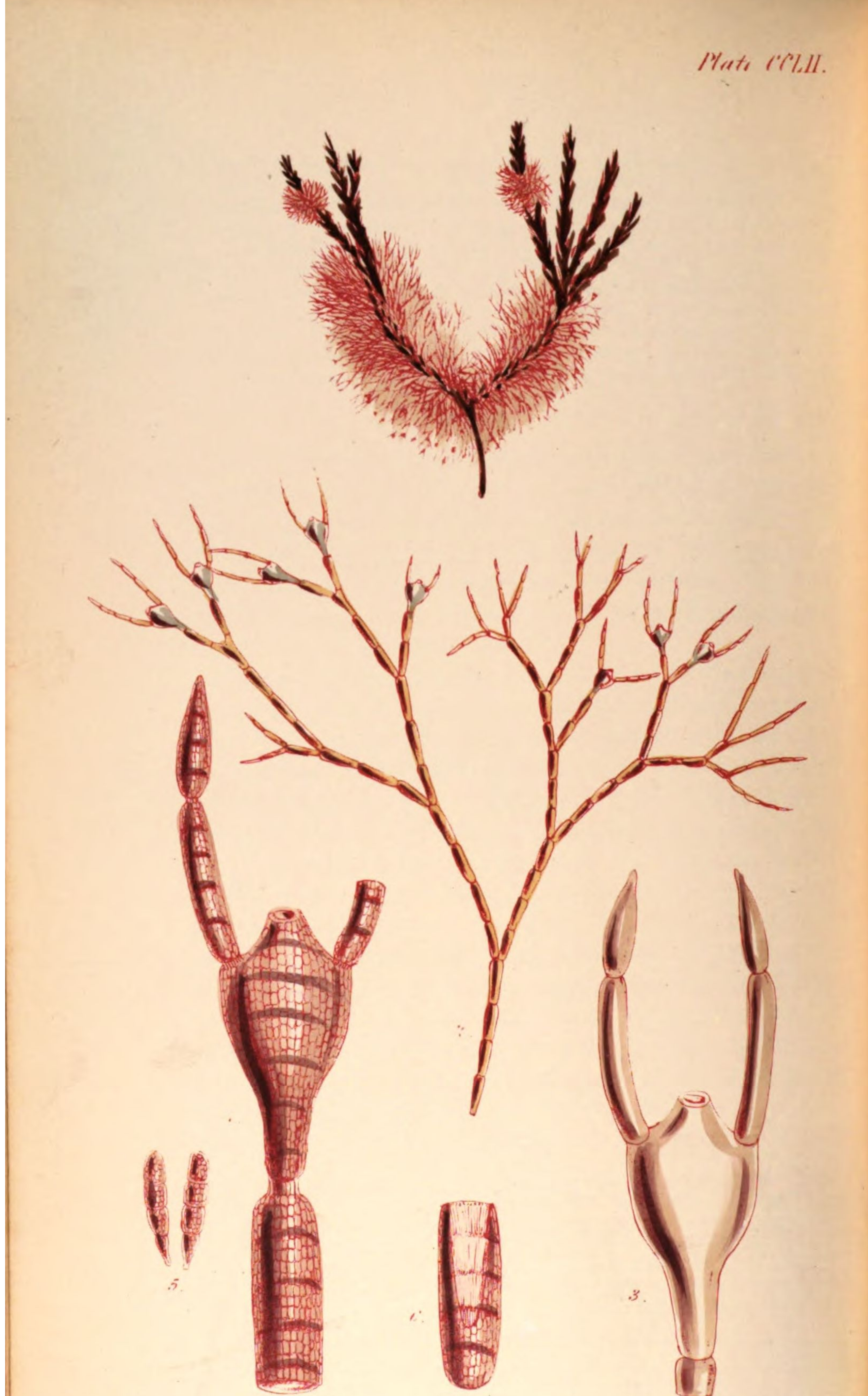
DESCR. *Root*, a widely spreading, calcareous crust. *Fronds* densely tufted, forming frequently large patches some yards in breadth, four to six inches high, twice as thick as hog's bristle, with an undivided or once or twice forked stem, set with distichous erecto-patent, more or less decompoundly pinnate branches. These branches are very irregular in length and in their degree of composition, some specimens being comparatively bare, others closely and many times pinnate. The penultimate branches or *plumules*, are from half an inch to an inch long, with a lanceolate or obovate outline, closely pectinato-pinnate, the pinnules opposite, a pair rising from every joint, subulate, and either simple or minutely pinnulate. The ultimate ramuli at the apices of the branches are di-trichotomous, a circumstance which, no doubt, accounts for the irregularity of ramification. *Articulations* of the lower part of the stem, very short, rounded, bead-like, with obtuse angles; the upper ones gradually becoming longer, broader, and flatter, with more and more prominent upper angles, until towards the summit of the stem, as well as in the lesser branches, all the articulations are broadly obconic, compressed, with very salient and acute upper angles. Articulations of the subulate ramuli not half the diameter of the others, more cylindrical, and thrice as long as their breadth, the terminal one acute. *Conceptacles* (probably of three kinds, two of which only are known to me); 1, urn-shaped, formed out of the last articulation of a branch, or ramulus, simple, or crowned at its superior angles with pair of horn-like ramuli, or

with another series of similar conceptacles of a smaller size; in these (fig. 3.) I have observed *trispores* (fig. 4). 2, hemispherical conceptacles, of a very minute size, resembling grains of sand, plentifully scattered, like warts, over the surface, hollow, exhibiting (when the calcareous matter is removed) a beautifully tessellated surface, and containing a tuft of crescent-shaped, transversely parted tetraspores (fig. 8). When the frond is macerated in acid, the lime is dissolved, and the joints exhibit regular transverse bands, and a longitudinal section shows the substance to be composed of very slender, perpendicular, elongated, cylindrical cells, alternating with smaller ones, and the outer ones, curving outwards at the tips, and ending at the circumference in a minute cell. *Colour*, a dark purple, soon fading on exposure.

This species was noticed at an early period, and has been generally kept separate from *C. officinalis*, which it closely resembles, by most authors who have written on the subject. It differs from *C. officinalis* chiefly in the form of the upper joints of the stem and branches, which are broad and flat, with prominent and usually sharp angles. As far as my experience goes, these characters are pretty constant.

The greatest anomaly which I have observed in this plant, is in the fructification, and this is so remarkable that had I not found it on specimens from the same locality, and otherwise the same, I should have been afraid to describe plants with such different fruit as identical. There appear to be three distinct forms of *Ceramidium* borne by *C. squamata*; the first, that proper to the genus, and which I have not found on the specimens figured: secondly, that proper to *Jania* (fig. 2, 3); and thirdly, that proper to *Amphiroa* (fig. 7). These two last I have found abundantly both on French and Irish specimens. Both the latter kinds of *Ceramidium* contain tetraspores, but those found in one of them are deficient in one joint. It is rather unfortunate for the stability of the genera into which the Linnæan *Corallina* has been split, to find an acknowledged species of one of the genera producing the fruit attributed to *both* the others!

Fig. 1. CORALLINA SQUAMATA:—*of the natural size.* 2. Apex of a fertile branch, with *urn-shaped* conceptacles. 3. A conceptacle, bearing two lesser ones. 4. *Trispores* from the same. 5. A branch with *wart-like* conceptacles, in its natural state. 6. The same, treated with acid, the lime being removed. 7. Terminal joints with fruit, from the same, showing a longitudinal *section* of the joint, and the interior of one conceptacle. 8. Tetraspores. 9. Basal joints. 10, 11. Cells of which the frond is built up: —*all more or less highly magnified.*



W.H.H. del. et lith.

R.B. & R. imp.

PLATE CCLII.

JANIA RUBENS, *Lamour*.

GEN. CHAR. *Frond* filiform, articulated, dichotomously branched, coated with a calcareous deposit. *Fructification*, urn-shaped *ceramidia* formed of the axillary articulation of the uppermost branches (mostly two horned), pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, transversely parted *tetraspores*. JANIA,—(*Lamour*), from *Janira*, one of the *Nereides*.

JANIA *rubens;* articulations of the principal branches and ramuli cylindrical, about four times as long as broad.

JANIA rubens, *Lam. Cor. Flex.* p. 272. *Gray, Brit. Pl.* vol. i. p. 339. *Flem. Brit. An.* p. 514. *Johnst. Brit. Lith.* p. 224. *Dne. Ess.* p. 111. *Endl.* 3rd *Suppl.* p. 49. *Kütz. Phyc. Gen.* p. 389.

CORALLINA rubens, *Ellis and Soland. Zooph.* p. 123. *Turt. Brit. Faun.* p. 211. *Lam. An. s. Vert.* 2nd edit. vol. ii. p. 517.

HAB. Parasitical on the smaller Algæ, between tide-marks. Perennial. Summer. On all parts of the British Coast.

GEOGR. DISTR. Shores of Europe. South Africa.

DESCR. *Fronds* from half an inch to an inch and a half in height, densely tufted, dichotomous, many times forked, fastigiate; branches either erect or spreading, gradually attenuated toward the apices. *Articulations* cylindrical in all parts of the frond, without prominent angles; those near the base very short, the upper ones gradually longer; those in the middle parts of the frond from four to five times longer than broad. *Apical* articulations either acute or obtuse, sometimes much attenuated, and sometimes nearly as robust as in other parts of the frond. *Ceramidia* subterminal, urnshaped, with long horns formed of from two to four articulations. When deprived of its lime by acid, the frond is distantly banded with dark, transverse striæ. *Colour* a pale red, with purplish shades when quite fresh.

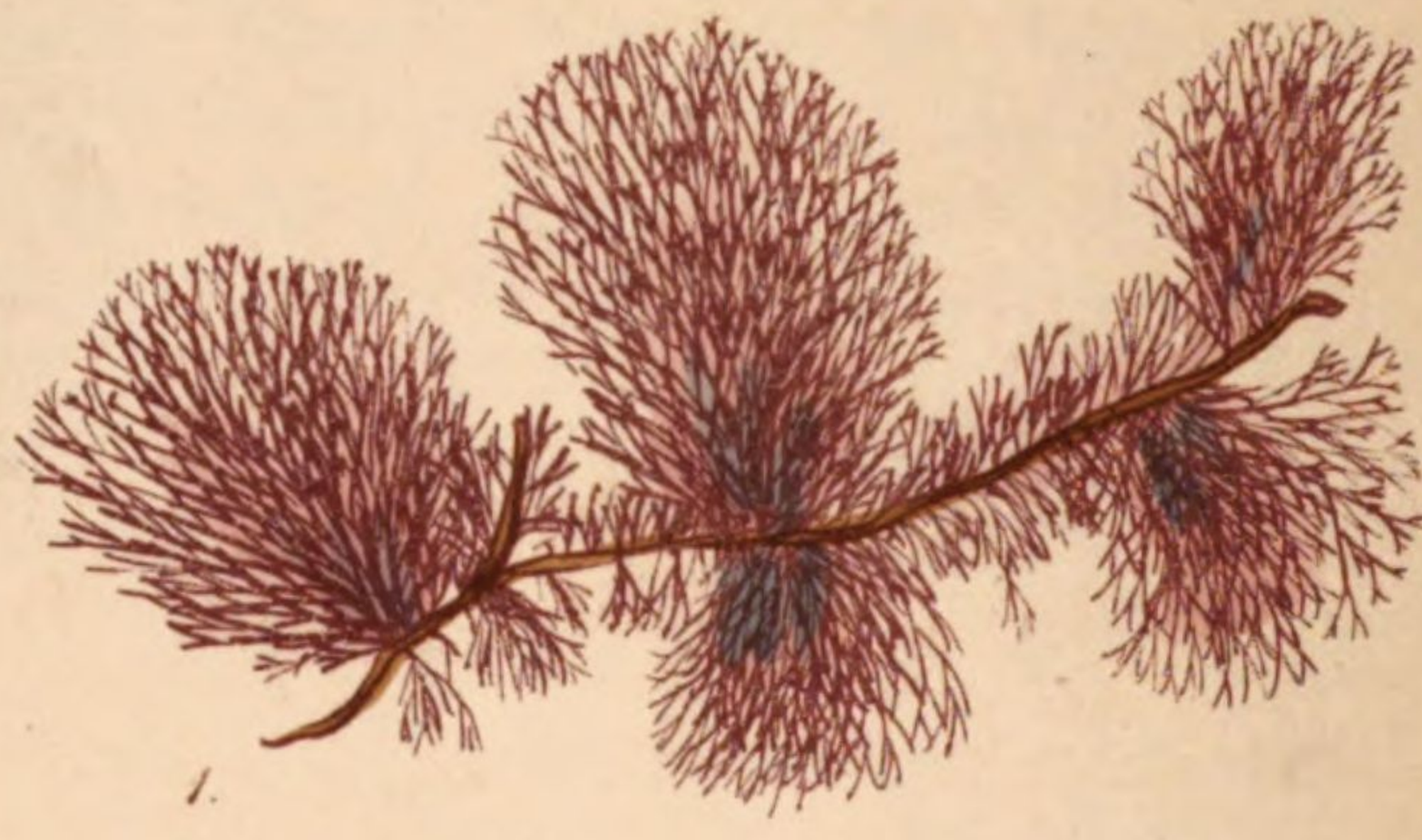
The commonest species of the genus Jania and the most widely diffused, abounding along the shores of Europe and having been brought also from the Southern Ocean. I have specimens from South Africa which nearly accord with those from our own coasts. It probably occurs on the American shore in equal abundance.

From *J. corniculata* (tab. nost. CCXXXIV.) which it outwardly much resembles, *J. rubens* may, at once, be known by the

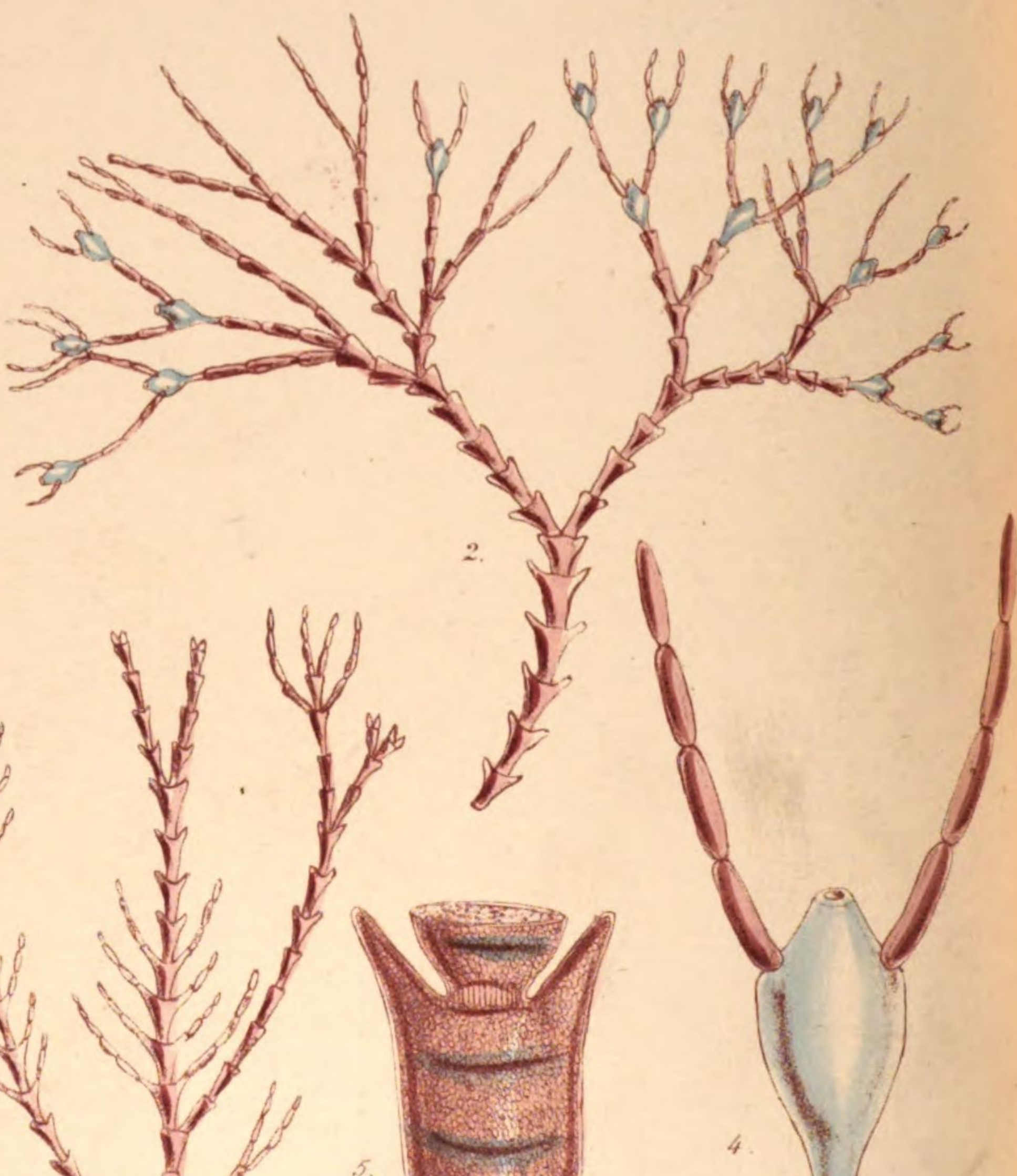
long, cylindrical lower articulations; and this much is generally sufficient to ascertain the species. But I observe, on some specimens, especially those from the South of England, an occasional prolongation of the upper angles of the articulation, showing a tendency to approach *J. corniculata*. Still, I have never seen a thoroughly intermediate specimen.

Several exotic species nearly resemble *J. rubens* in habit, differing chiefly in size and in the comparative length of the articulations.

Fig. 1. JANIA RUBENS, growing on *Cladostephus*:—*of the natural size.* 2. A branch. 3. Ceramidium. 4. The same, after maceration in acid. 5. Tetraspores. 6. An articulation, from which a transverse slice has been removed, showing the internal structure:—*all magnified.*



1.



2.

3.

5.

4.

PLATE CCXXXIV.

JANIA CORNICULATA, *Lamour.*

GEN. CHAR. *Frond* filiform, articulated, dichotomously branched, coated with a calcareous deposit. *Fructification* urn-shaped *ceramidia*, formed of the axillary articulation of the uppermost branches (mostly two horned), pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, transversely parted *tetraspores*. JANIA (*Lamour.*),—I suppose from *Janira*, one of the *Nereides*.

JANIA *corniculata*; articulations of the principal divisions obconical, compressed, their upper angles sharp and prominent; those of the uppermost ramuli cylindrical, filiform.

JANIA corniculata, *Lam. Cor. Flex.* p. 274. *Corall.* p. 123. *Gray, Nat. Ar. Br. Pl.* vol. i. p. 339. *Flem. Brit. Anim.* p. 514. *Johnst. Spong. and Lith.* p. 227. *Decne. Ess.* p. 111. *Endl. 3rd Suppl.* p. 49. *Kütz. Phyc. Gen.* p. 389.

CORALLINA corniculata, *Linn. Syst.* p. 806. *Pal. Elench.* p. 424. *Ellis and Soland. Zoop.* p. 121. *Turn. Br. Faun.* p. 212. *Lam. An. s. Vert.* 2nd Ed. vol. ii. p. 517.

HAB. Parasitical on the smaller Algæ, in rock pools between tide-marks, and in 4–5 fathoms water. Perennial? Summer. Southern shores of England and Ireland. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Fronds* densely tufted, one or two inches high, repeatedly dichotomous, fastigiate, the branches spreading, gradually attenuated towards the apex. In young specimens the branching is always regularly forked, but older specimens frequently show in their lower parts a disposition to become pinnated, from lateral opposite ramuli issuing from their joints. These ramuli, as well as the terminal forkings, are much narrower than other parts of the frond. *Articulations* of the principal branches twice or thrice as long as broad, tapering to the base, gradually enlarged upwards, compressed, their upper angles more or less produced, sometimes extending at each side into a long conical horn; articulations of the lesser branches and ramuli cylindrical. *Ceramidia* urn-shaped, in the upper axils. On maceration in acid, transverse striæ become visible in the articulations.

The genus *Jania*, if we confine it to the dichotomously branched species, may be allowed to stand as distinct from *Corallina*—at least in habit;—but it must be admitted that the two genera approach very nearly, if they do not rather merge one in the other. Had we only to consider European forms we might think differently. But the shores of warm countries, and espe-

cially of Australia, yield beautiful species, having the pinnated habit of *Corallina* with the *antennated* fruit (if so I may call it) of *Jania*. These form the section of *Jania*, called *Haliptilon* by Decaisne, and I have already figured, on *Corallina squamata*, fruit which, did it occur on an Australian specimen, would entitle the individual furnished with it to a place in the subgenus *Haliptilon*.

Jania corniculata differs from the more common *J. rubens* chiefly, if not altogether, in the form of the lower articulations; much as *Corallina squamata* differs from *C. officinalis*. The species has been generally kept up by all authors, since the time of Ellis, who first distinguished it. On the British shores it is most common on the southern coast, while *J. rubens* is found all round the island.

Fig. 1. JANIA CORNICULATA:—*of the natural size.* 2. Portion of the branching stem. 3. Portion of another stem, becoming pinnated. 4. Ceramidium and ramuli. 5. Articulation of the stem after maceration in acid:—*all more or less magnified.*

1.

3.

2.

4.

5.

W.H.H.del et lith.

Reeve & Nichols, imp.

PLATE CCCXLV.

MELOBESIA POLYMORPHA, *Linn.* (sp.)

GEN. CHAR. *Frond* attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit. *Fructification*: conical, sessile *ceramidia*, scattered over the surface of the frond, and containing a tuft of transversely parted, oblong *tetraspores*.—Named from one of the Sea-nymphs of Hesiod.

MELOBESIA *polymorpha*; frond attached to rocks, thick, stony, encrusting, or rising into short, clumsy branches, which are seldom much divided, and often merely rudimentary; ceramidia minute, depressed, extremely numerous.

MELOBESIA polymorpha, *Harv. Man.* ed. 2. p. 108.

MILLEPORA polymorpha, *Linn. Syst. Nat.* 1285. *Ellis and Soland. Zoop.* 130.

NULLIPORA polymorpha, *Johnst. Brit. Lith.* p. 238. t. 24. f. 1, 2, 3 (?), and t. 25. f. 23. (in part.)

SPONGITES polymorpha, *Kütz. Sp. Alg.* p. 699.

CORALLIUM cretaceum lichenoides, *Ellis, Cor.* p. 76. t. 27. fig. d. D. *(fide fig.)*

HAB. On littoral rocks all round the coast, extending beyond low-water mark. Common.

GEOGR. DISTR. (*Probably widely dispersed.*)

DESCR. *Frond* at first appearing on the surface of rocks, pebbles, or shells, in the form of little stony pimples, which gradually become confluent, so as to form an uneven crust, resembling one of the crustaceous *Lichens*, and spreading over indefinite spaces. This crust gradually grows thicker by successive thin coats of cellular and calcareous substance formed and deposited on the surface, and is very irregular in form; sometimes continuing nearly flat, sometimes rising into irregular stony knobs or lumpy masses, and sometimes throwing up short, erect, scarcely divided branches. *Ceramidia* minute, dot-like, sunk deeply in the outer layer of cells, extremely numerous and often puncturing over the whole surface of fertile fronds as if they had been closely marked with pin-holes. *Colour* variable according to the locality, dark lurid purple near low-water mark, and passing into chalky-white as the specimens grow nearer high-water mark. *Cells* of which the frond is composed about twice as long as their diameter. *Substance* stony.

To this form I refer most of the lumpy *Nullipores*, with thick

stony fronds, and of various uncertain shapes, found encrusting tidal rocks, and occasionally thrown up or dredged from deeper water. Dr. Johnston's figures, at Plate XXIV. 1, 2, 3, of his 'History of British Sponges and Lithophytes,' represent a form which abounds in Dalkey Sound, near Dublin, and on which the late Mr. M'Calla founded a species which he called *Nullipora compressa*. It perhaps ought to receive a specific name, but, if left unennobled, it seems to me rather to fall, as a variety, under *M. calcarea*, than under the present species.

Fig. 1 and 2, different specimens of MELOBESIA POLYMORPHA:—*the natural size*. 3. Small portion of a fertile frond, showing the ceramidia. 4. Vertical section of the frond, to show arrangement of cellular coats:—*both magnified*. 5. Cellular structure:—*highly magnified*.

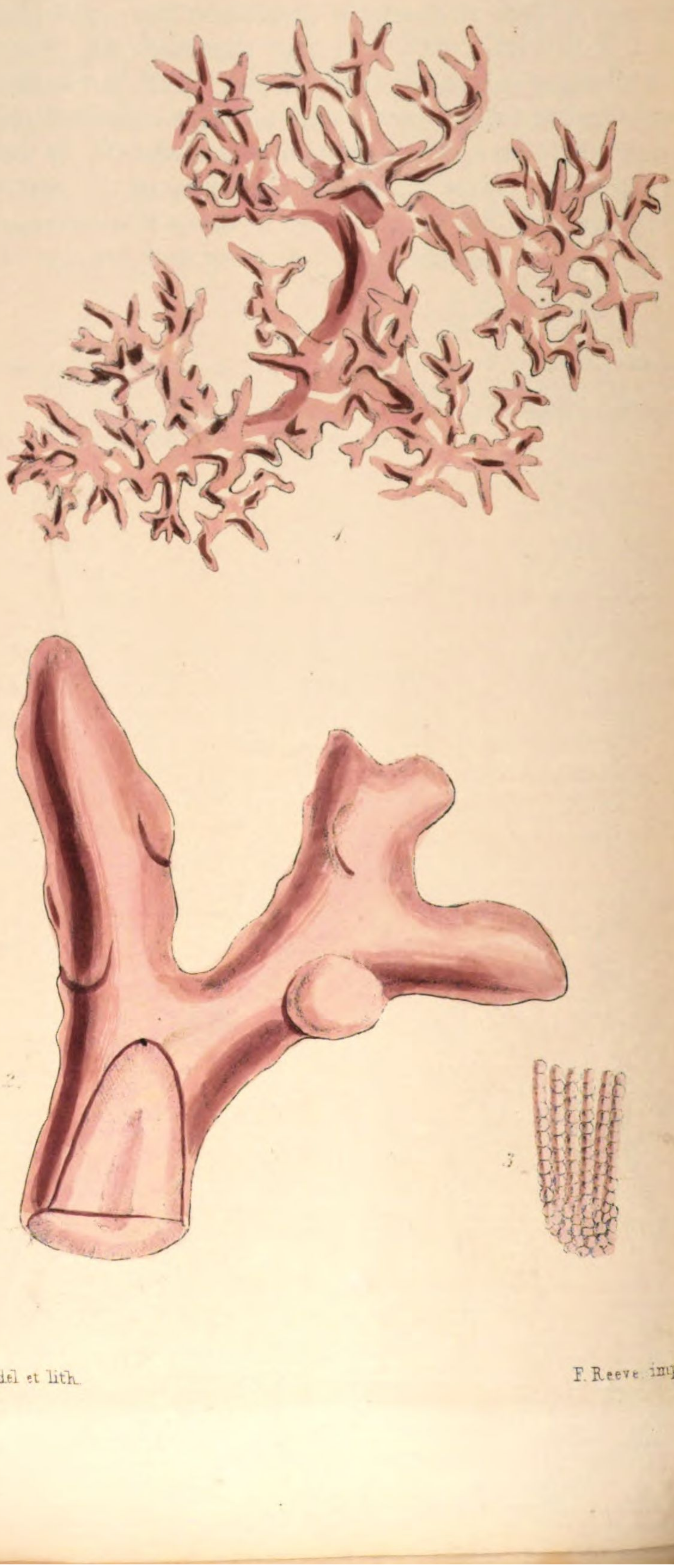


PLATE CCXCI.

MELOBESIA CALCAREA, *Ell. et Sol.*

GEN. CHAR. *Frond* attached, or free, either flattened, orbicular, sinuated, or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit. *Fructification*, conical, sessile *capsules* (*ceramidia*), scattered over the surface of the frond, and containing a tuft of transversely parted, oblong *tetraspores*. MELOBESIA (*Lamour.*),—from one of the sea-nymphs of Hesiod.

MELOBESIA *calcarea*; frond unattached, stony, shrub-like, much branched; branches slender, spreading in all directions, cylindrical, anastomosing below, free above, and tapering to a blunt point; ramuli either simple or forked.

NULLIPORA calcarea, *Johnst. Brit. Lith.* p. 240. t. 24. f. 4, 5.

NULLIPORA fragilis, *M'Calla.*

SPONGITES calcarea, *Kütz. Sp. Alg.* p. 699.

MILLEPORA calcarea, *Ell. et Sol. Zooph.* p. 129. t. 23. f. 13. *Lam. An. s. Vert.* ed. 2. vol. ii. p. 312.

HAB. On shingly or sandy shores, in 5–15 fathom water. Perennial.—Coasts of South of England, and West of Scotland and Ireland, abundant in many places.

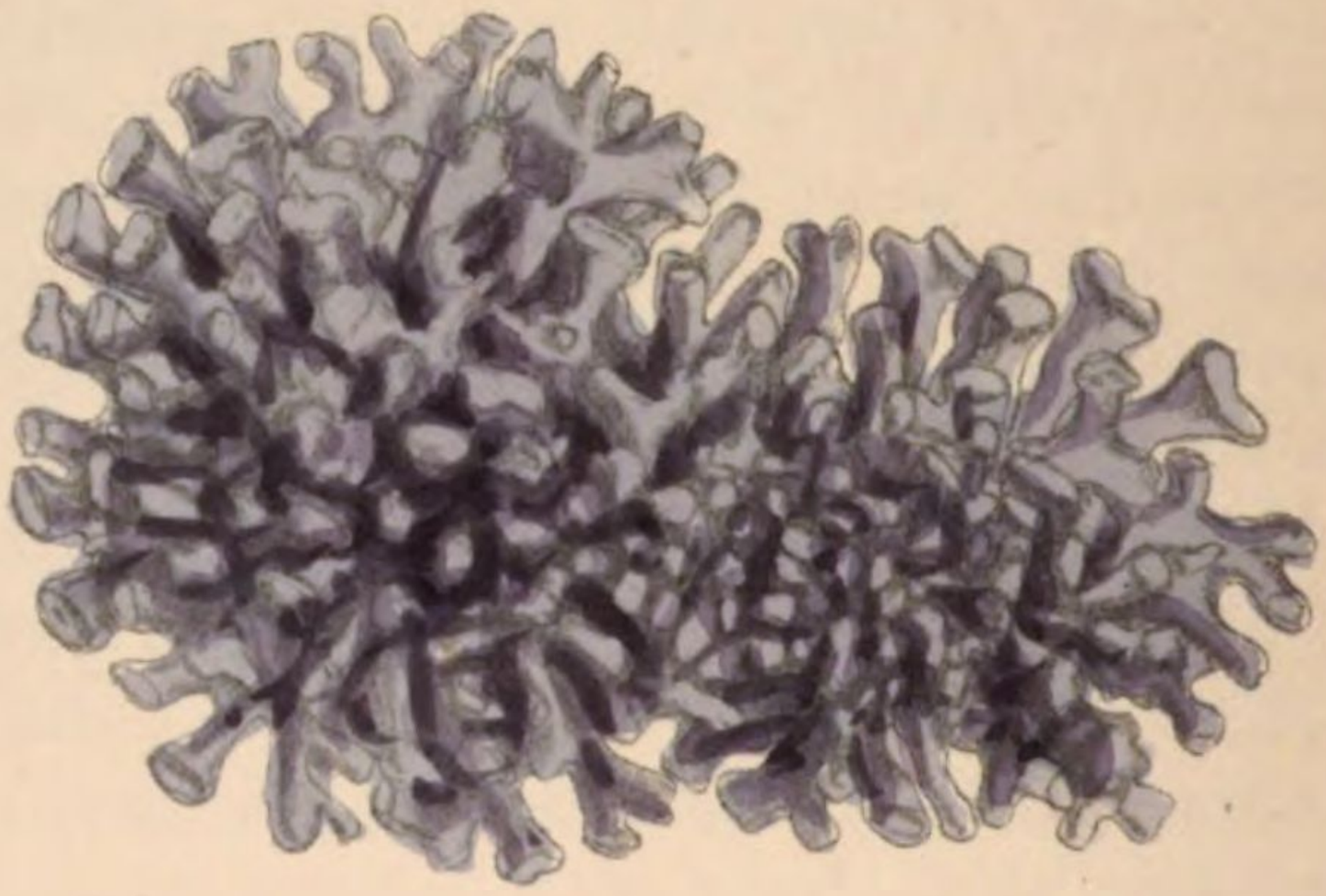
GEOGR. DISTR. Probably widely dispersed; I have specimens from New Zealand (*Dr. J. D. Hooker*), and the Galapagos Group (*Mr. Darwin*).

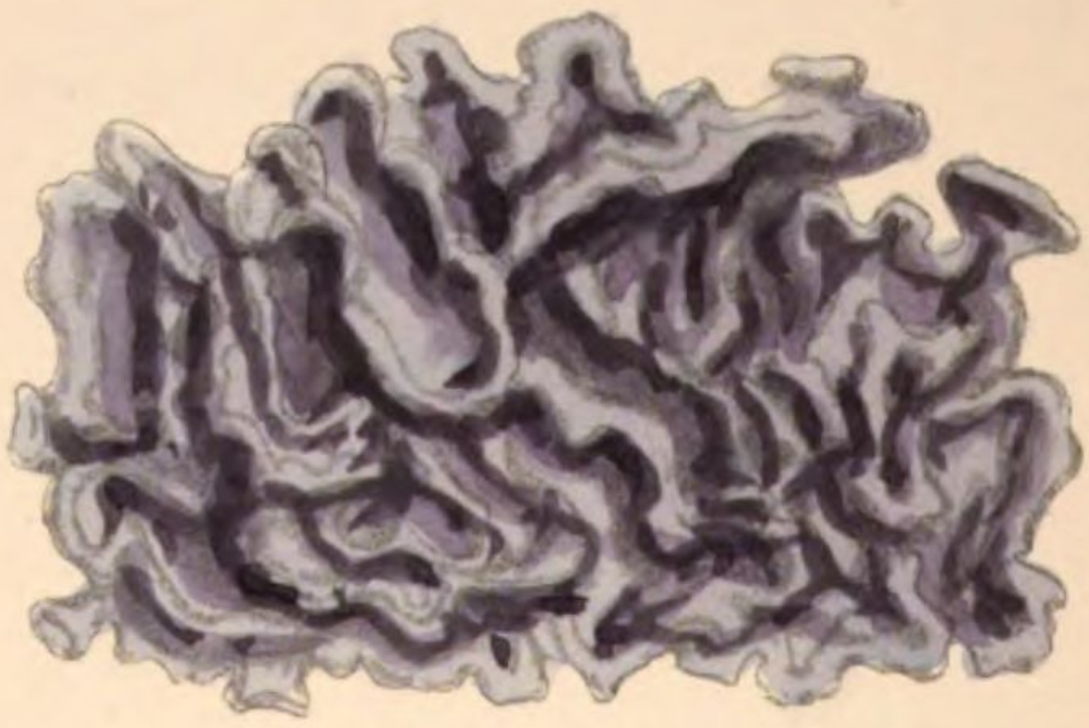
DESCR. *Fronds* lying at the bottom of the sea without any attachment, heaped together in large masses, on widely spreading strata, the surface individuals of which only are alive. Each plant is from one to three or four inches in diameter, forming a roundish shrub-like mass of stony branches, which spring from a thickened centre, and extend in all directions, being more or less confluent in their lower part, but quite free above. These branches are flexuous, irregularly divided, either dichotomous or fingered, terete, gradually tapering towards the extremity, and ending in a blunt point. *Substance* stony, very brittle. *Colour*, when quite fresh, a deep blood-red, soon passing, on the death of the plant, to that of brick-dust, and, after bleaching in the sun, to a snowy whiteness. The tissues throughout the whole frond are filled with carbonate of lime, which must be removed by acid before the cells can be seen:—the latter are then found to be very minute, arranged in slender, closely-packed series or threads.

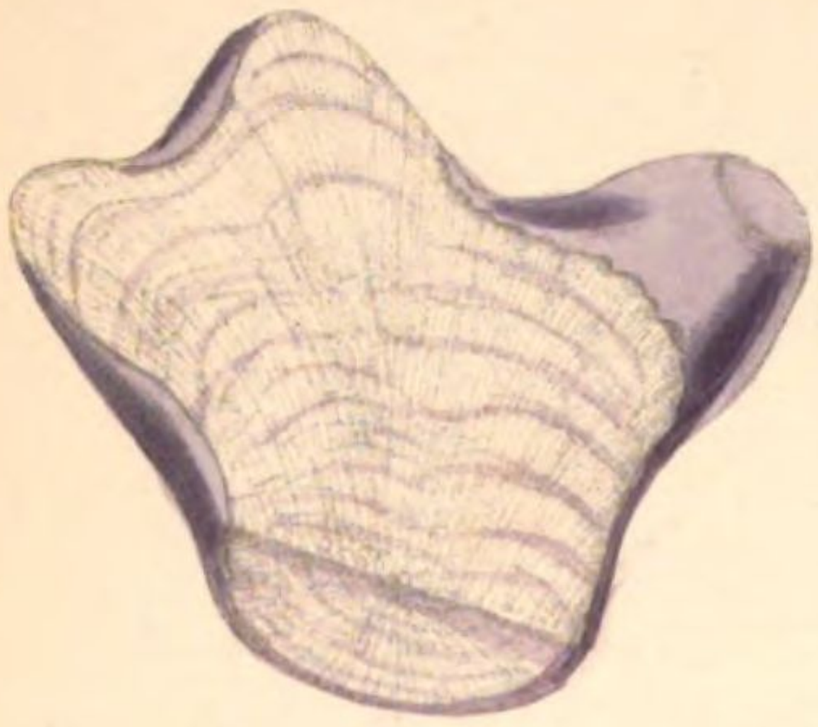
This is one of the commonest of the British deep-water species of *Melobesia*, being found in many parts of the coast, and generally

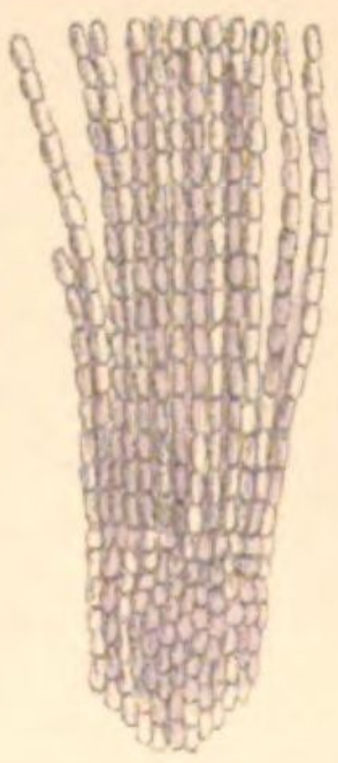
in great abundance. It forms extensive banks, on which the fronds are heaped together without order, and appear to be kept from drifting merely by their weight. The specimens at the top of the banks are alone living; those underneath, as may be at once known by their faded colour and offensive smell, are always found dead. In the West of Ireland, where this species abounds, it has been used as manure with success, being particularly suited to a peaty soil; but, as it requires to be dredged up—its weight and the depth at which it vegetates preventing its being drifted in quantity ashore,—the full use is not made of it by the peasantry which its value would seem to call for. In many districts where lime is scarce, a considerable quantity might be obtained by burning this plant. The "coral sand," so abundantly employed on the shores of Bantry Bay, owes its fertilizing properties to the remains of Cellepores and other zoophytes, of whose débris it chiefly consists.

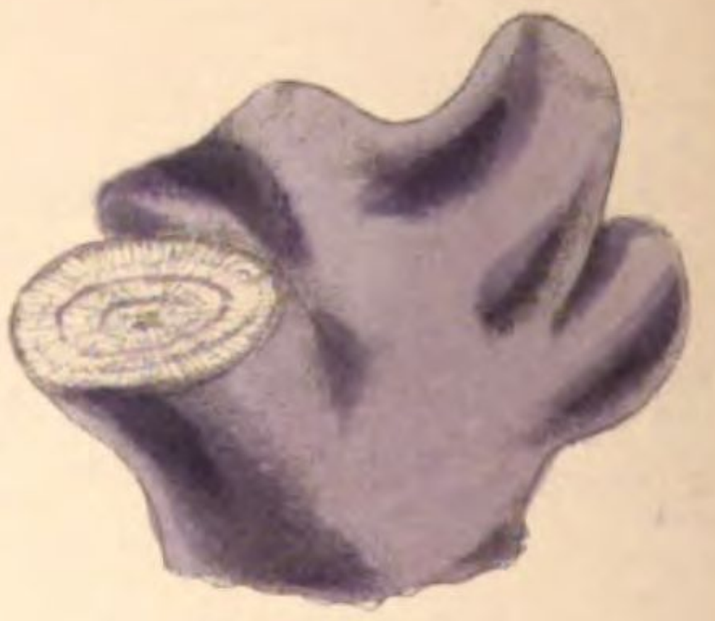
Fig. 1. MELOBESIA CALCAREA:—*the natural size.* 2. Portion of a branch, cut to show the internal structure:—*slightly magnified.* 3. Cells of which the frond is composed:—*highly magnified.*











3 5 4

W H H del et lith. Recve imp.

PLATE LXXIV.

MELOBESIA FASCICULATA, *Harv.*

GEN. CHAR. *Frond* attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit. *Fructification*; conical, sessile *capsules* (*ceramidia*) scattered over the surface of the frond, and containing a tuft of transversely parted, oblong tetraspores. MELOBESIA (*Lamour.*) —from one of the Sea nymphs of Hesiod.

MELOBESIA *fasciculata*; frond unattached, roundish or lobed, stoney, much branched, fastigiate; branches solid, thick, crowded together, cylindrical or compressed; apices truncate, broad, somewhat concave.

MILLEPORA fasciculata, *Lam. An. s. vert.* vol. ii. p. 203. *2nd. Edit.* p. 211.

NULLIPORA fasciculata, *Blainv. Actin.* p. 605. *Johnst. Br. Spon. and Lith.* p. 240. t. 24. f. 6.

LITHOTHAMNIUM crassum, *Phil. in Wieg. Arch.* 1837. p. 388?

HAB. Lying on the sandy bottom of the sea, in 4–5 fathom water. Roundstone Bay, *Mr. Mc' Calla.*

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

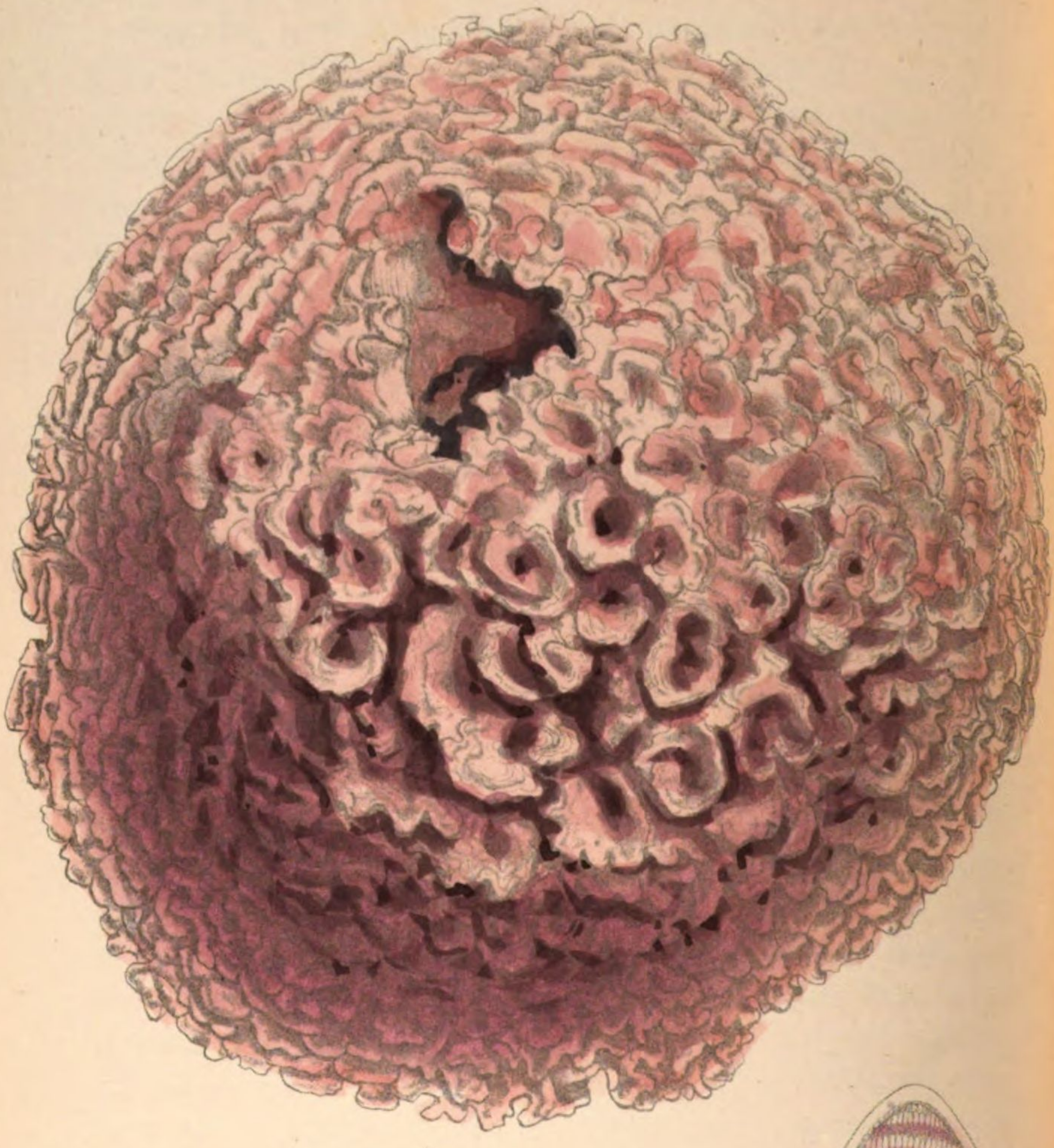
DESCR. *Fronds* from one to three inches in diameter, roundish or irregularly lobed, composed of a solid central stony mass of no determinate form or size, from which issue in all directions numerous short, thick, cylindrical or laterally compressed, crowded branches divided in an irregularly dichotomous manner, all nearly fastigiate, and remarkably truncated at the tips, which are moreover depressed in the centre. These broad, flattened or subconcave tips are the least variable character of the species. In other respects it is subject to much variety. Sometimes the branches are reduced to mere rudiments, or very much flattened; and sometimes the frond presents little else than an aggregate of thickened tabular pieces. The colour when recent, is a livid purple; when dried, it fades to a dirty white. Under the microscope, after the calcareous matter has been removed by acid, a longitudinal section shows a fibrous surface, marked here and there by obscure zones; and a transverse cutting exhibits a radiate arrangement of the cells. Under a lens of high power, the fibres resolve themselves into delicate, jointed, slightly moniliform filaments, easily separating one from another, toward the surface, but massed together into an irregularly cellular substance, at a greater depth within the frond.

This species would fall under the genus *Lithothamnium* of Philippi, if it be not the same that he has described by the name *L. crassum*. I think it must be by a slip of the pen that Decaisne unites these plants to *Amphiroa*, from which genus they differ in

many ways, while they nearly, or altogether coincide with his own group *Spongites* in *Melobesia*.

Under the preceeding plant I have mentioned that the vegetable nature of the *Corallines* is now distinctly proved. The question still remains, whether the productions here called *Melobesiæ* (*Nulliporæ*, Lam.) are independent vegetables; or whether they be, as has been held by several naturalists, merely amorphous states of the common *Corallina officinalis*. This is the view of the subject advocated by Dr. Johnstone, whose opinion, founded on observation, and as the opinion of an accomplished naturalist who has paid much attention to the lower tribes of animals, and is familiar with variations in form among sponges, nearly as wild as this would be, must not be too hastily condemned. In the present state of my acquaintance with these plants I do not feel myself warranted in giving a direct negative to Dr. Johnstone, although, so far as my opportunities enable me to judge, I am not disposed to agree with his view of the subject. Granting that the base of *Corallina officinalis* is a calcareous expansion resembling the frond of a *Melobesia*, I cannot therefore suppose that objects, like that figured in our last plate, together with the minute *Melobesia pustulata*, found on the leaves of the *Zostera*, are merely such bases which have omitted to develope true fronds. It should be borne in mind that the *Melobesiæ* have their proper organs of *fructification*, and that these are similar in nature to, though slightly different in form from, those of *Corallina*; and this I consider affords the strongest evidence of their independent nature, and the strongest probability of their being fully developed organisms. Still I will not say that it is conclusive evidence; for we must remember that in plants of greatly more perfect organization, the *Orchideæ*, more than one instance has occurred of floral organs so different in structure as to be referable to different genera, having been produced at different times by the same root, and at last occurring together on the same stem! If such things happen among flowering plants, what may we not expect on the confines of the Vegetable Kingdom?

Fig. 1, 2. MELOBESIA FASCICULATA, different varieties:—*the natural size.* 3. A longitudinal section. 4. A transverse section of a branchlet:—*slightly magnified.* 5. Cellular threads of which the frond is composed:—*highly magnified.*



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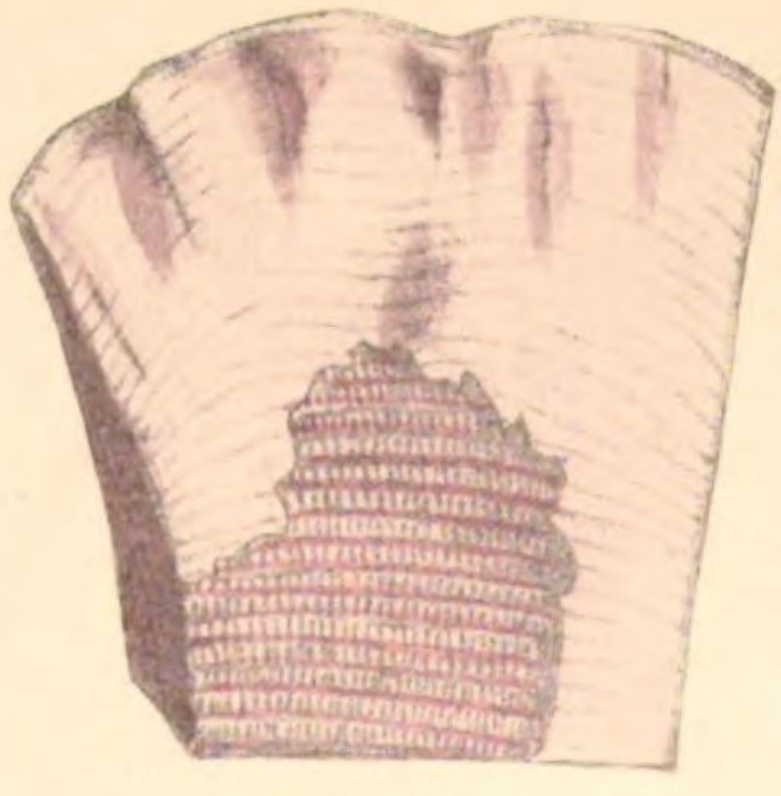

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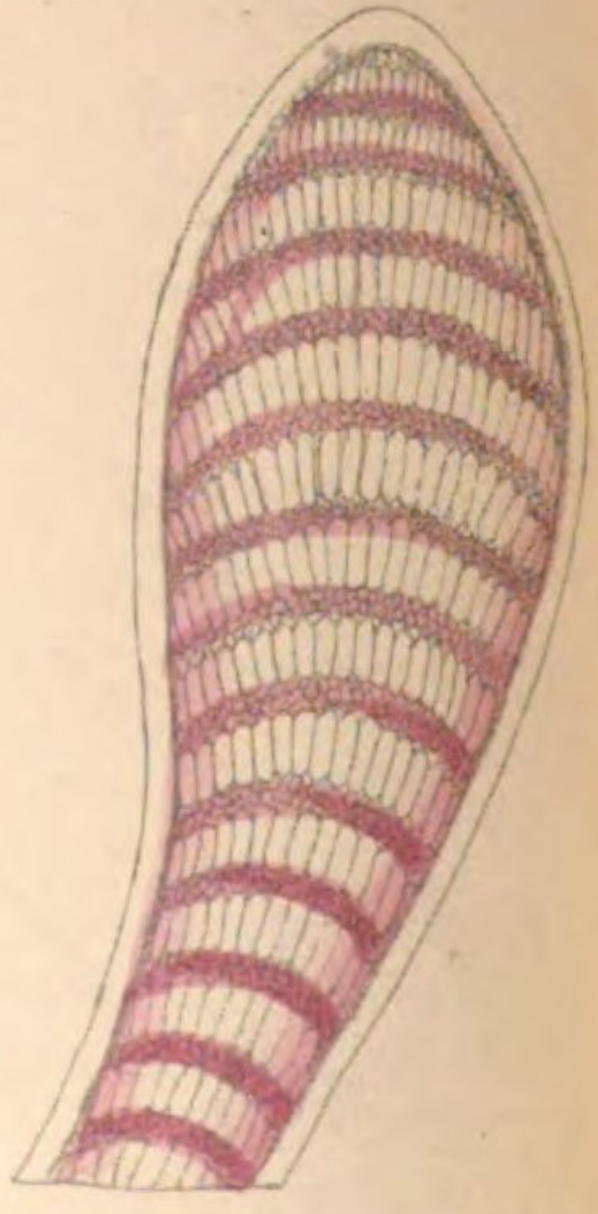

3

W H H del et lith

Reeve imp

PLATE LXXIII.

MELOBESIA AGARICIFORMIS, *Harv.*

GEN. CHAR. *Frond*, attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched, (never articulated), coated with a calcareous deposit. *Fructification*; conical, sessile *capsules* (*ceramidia*), scattered over the surface of the frond, and containing a tuft of transversely parted, oblong *tetraspores*. MELOBESIA (*Lamour.*),—from one of the Sea nymphs of Hesiod.

MELOBESIA *agariciformis*; frond unattached, globular, hollow; foliations delicate, papyro-crustaceous, dense, erect, much lobed and sinuate, fastigiate; margin thin, entire.

MILLEPORA agariciformis, *Pall. Elench.* p. 263. *Lam. An. s. vert.* vol. ii. p. 204. *2nd. Edit.* p. 2. 312.

MILLEPORA coriacea, *Linn. Syst.* p. 1285. *Esp. Mill.* t. 12.

MILLEPORA decussata? *Ellis et Soland. Zooph.* p. 131. t. 23. f. 9.

MILLEPORA tortuosa, *Esper.* t. 22.

NULLIPORA agariciformis, *Blainv. Actin.* p. 605. *Johnst. Br. Spon. and Lith.* p. 241. *woodcut*, no. 23.

POLLICIPORA agariciformis, *Ehr. Beitr.* p. 129.

LITHOPHYLLUM expansum, *Phil. in Wieg. Arch.* 1837. p. 389. *excl. syn.*

MELOBESIA expansa, *Endl. 3rd Suppl.* p. 49.

LITHOPHYLLUM decussatum? *Phil. l. c.* t. 9. f. 4.

MELOBESIA decussata? *Endl. l. c.*

MOSCO petroso, *Imperat. Hist. Nat.* 600. *cum. icone.*

FAVAGINE di Aristotele, *specie prima*, *Ginnani. Op.* t. 44.

HAB. Lying on the sandy bottom of quiet bays, in 2–3 fathoms water. Rare. Roundstone Bay, Cunnemara, in one or two places only, abundant but very local, *Mr. Mc Calla.*

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Frond*, unattached, forming globular or ovoid masses from four to eight inches in diameter, hollow within, seemingly from the decay of the central portion; very light, of a papery thinness and crustaceous substance; composed of innumerable sinuated and lobed laminæ, issuing from a point towards the centre of the frond, and directed in a radiating manner to the circumference. In the centre of the frond the laminæ are much united together, with vacant spaces and passages forming an irregular set of chambers; toward the circumference, the lobes are distinct from each other, standing erect, variously grouped; either sinuated, or bent into semicircular forms, imbricating on each other, or curled round into little cups, or trumpet mouthed siphons. The apices of all are nearly fastigiate, and the margin is thin and quite entire. The *colour* when recent, is more or less tinged with

rosy-pink; when dry it fades to a yellowish; and when exposed to the sun becomes perfectly white, and rapidly crumbles to powder. Under the microscope, a longitudinal section (when the calcareous matter has been removed by acid) shows a series of concentrical zones, formed of oblong cells separated by narrow spaces, filled with granular cellules, or possibly the appearance of bands may arise from the remains of calcareous matter. Fig. 3. represents a section of this description.

I follow Decaisne in referring the *Nulliporæ* of Lamarck to the *Melobesiæ* of Lamouroux, the latter name having been generally adopted by such botanists as have described these productions, and the former by such zoologists as lay claim to them. Both names originated in 1816, and whichever have priority, it must be a narrow question of months, which I am unable to decide. The species here figured would belong to *Spongites* of Kützing, and to *Lithophyllum* of Philippi; but does not appear in the list of *Melobesiæ* given by Decaisne, nor yet, except under the more modern trivial name, *decussata*, in that of Endlicher. Nevertheless it is one of the earliest known species, as its numerous synonymes testify.

The question of the vegetable nature of *Corallines*, among which the *Melobesiæ* take rank, may now be considered as finally set at rest, by the researches of Kützing, Philippi, and Decaisne, whose various memoirs, particularly that of the last named, have thrown much light on this obscure department of natural history, and fully confirmed the early views taken by Peyssonel, the elder Jussieu, Pallas, &c., in opposition to those of Ellis and most succeeding authors, who have associated them with the zoophytes. Outwardly, indeed, there is a striking resemblance, not less in form than in substance, between the Corallines and Corals; but it is merely an outward resemblance. Whoever macerates a portion of one of these stony vegetables in weak acid, till the lime it contains be dissolved, will find that he has a structure of a totally different nature from that of any zoophyte, while it is perfectly analogous to that of many Algæ. There is a near affinity, indeed, between the *Corallinæ* and the *Rhodomeleæ*; or perhaps still more, the *Condrieæ*.

Fig. 1. MELOBESIA AGARICIFORMIS: — *the natural size.* 2. Portion of a lamina, with some of its epidermis removed, showing the banded arrangement of the cellules: —*slightly magnified.* 3. Longitudinal section of the same: —*highly magnified.*

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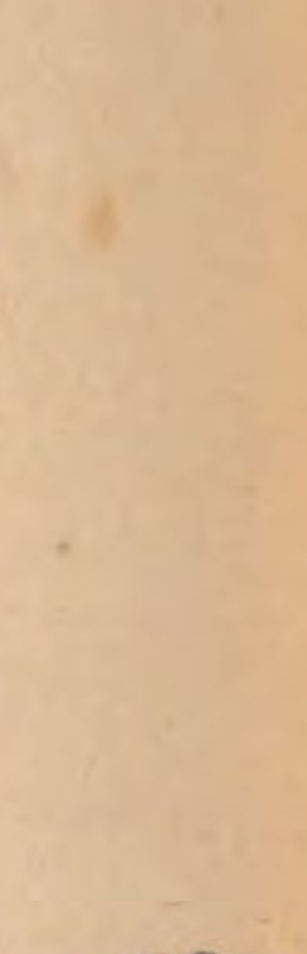

4.

W.H.H. del et lith.

Reeve & Nichols imp.

PLATE CCCXLVI.

MELOBESIA LICHENOIDES, *Borl.* (sp.)

GEN. CHAR. *Frond* attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit. *Fructification*: conical, sessile *ceramidia*, scattered over the surface of the frond, and containing a tuft of transversely parted, oblong *tetraspores*.—Named from one of the Sea-nymphs of Hesiod.

MELOBESIA *lichenoides*; frond attached to rocks, free at the margins, foliaceous, lichen-like, variously lobed; foliations spreading, often imbricated; ceramidia large, conical, prominent.

MELOBESIA lichenoides, *Harv. Man.* ed. 2. p. 109.

MILLEPORA lichenoides, *Borl. Cornw.* p. 239. pl. 24. f. 2, 3, 5. *Soland. Zoop.* p. 131. pl. 23. f. 10, 12.

HAB. On rocks and in tide-pools near low-water mark. Coast of Cornwall, *Rev. Dr. Borlase.* West of Ireland, abundant on the coasts of Galway and Clare, *W. H. H.* Coast of Cork, *Dr. Allman.* (Probably common on the W. and S. W. shores.)

GEOGR. DISTR. ?

DESCR. *Frond* thin and foliaceous, stony, spreading over rocks and stones in somewhat circular patches; not attached at the margins, and frequently but imperfectly attached in the centre. Many fronds grow together in the same patch, and their margins, which are much lobed and somewhat crenate, lie one over another. The lobes commonly extend in a horizontal direction, but sometimes stand erect; the habit varying greatly according to the place where the plant grows. *Ceramidia* large, prominent, obtusely conical, scattered, or collected in groups. *Cells* of which the substance is composed many times longer than their diameter. When the lime has been removed by acid, a thin slice shows a beautifully zoned structure under the microscope. *Colour* varying from dark lurid purple (in deep water) to creamy white near high-water mark. *Substance* thin and brittle.

This is by much the prettiest and most plant-like of the tidal *Nullipores*, strongly resembling in form and general habit one of the foliaceous lichens of the genus *Parmelia*, but differing in being of a stony substance;—thin however as paper, and very brittle. It is closely related to *M. agariciformis*, figured in one of our early numbers, from which it differs more in general

habit than by any precise character; that species growing in globose masses, which are unattached, and lie, subject to the drifting of the waves, on the sea-bottom.

Mastophora licheniformis, Dcne., which Kützing refers to the plant now figured, is very different in many ways, generically and specifically.

Fig. 1. MELOBESIA LICHENOIDES; growing on a piece of rock:—*the natural size.* 2. Portion of a frond:—*magnified.* 3. Vertical section through an (*empty*) ceramidium:—*magnified.* 4. Portion of the cellular substance:—*highly magnified.*

B.

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A.

1.

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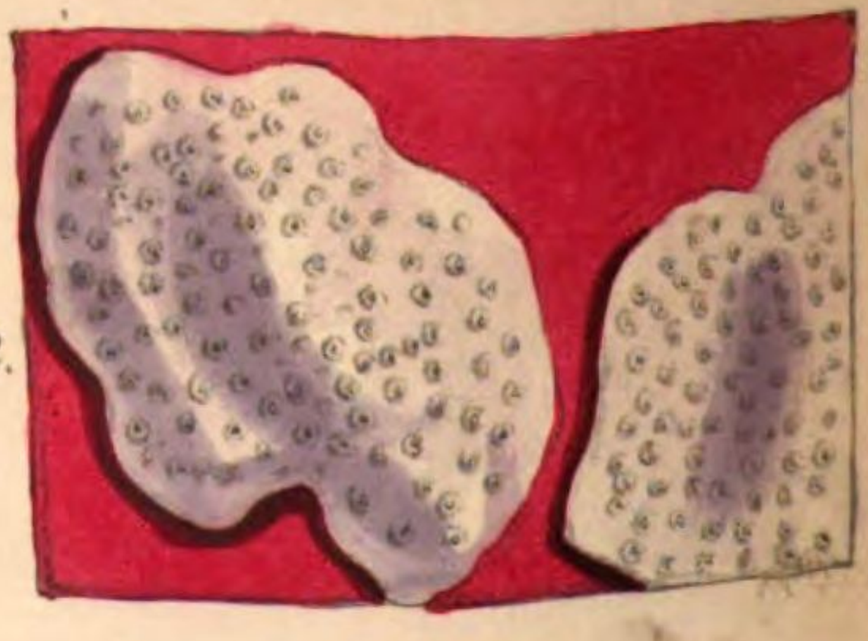
D.

1.

2.

C.

1.



2.

W.H.H. del et lith.

Reeve & Michaels imp.

PLATE CCCXLVII. *A*.

MELOBESIA MEMBRANACEA, *Lamour*.

GEN. CHAR. *Frond* attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit. *Fructification*: conical, sessile *ceramidia*, scattered over the surface of the frond, and containing a tuft of transversely parted, oblong *tetraspores*.—Named from one of the Sea-nymphs of Hesiod.

MELOBESIA *membranacea*; minute, dot-like, very thin, pale purple, circular, at length confluent, attached to other Algæ; ceramidia one or two, depressed.

MELOBESIA membranacea, *Lamour. Cor. Flex.* p. 315. pl. 12. f. 2, 3. *Harv. Man.* ed. 2. p. 109.

HAB. Common on the leaves of *Zostera*, the fronds of *Chondrus crispus*, &c. All round the coast.

GEOGR. DISTR. Atlantic and Mediterranean coasts of Europe.

DESCR. *Frond* from half a line to a line in diameter, very thin and filmy, circular at first, then, from several becoming confluent, more or less lobed or irregular. *Ceramidia* one or two, depressed.

A. Fig. 1. MELOBESIA MEMBRANACEA, growing on a leaf of *Zostera*:—*the natural size*. 2. A portion *magnified*.

PLATE CCCXLVII. *B*.

MELOBESIA FARINOSA, *Lamour*.

MELOBESIA *farinosa*; minute, irregular in outline, rather thin, pallid, with two or three prominent ceramidia.

MELOBESIA farinosa, *Lamour. Cor. Flex.* p. 315. pl. 12. *Harv. Man.* ed. 2. p. 109. *Kütz. Sp. Alg.* p. 696.

HAB. On various Algæ.

DESCR. Rather larger and thicker than the preceding, with more prominent fruit. In other respects similar.

B. Fig. 1. MELOBESIA FARINOSA, growing on *Phyllophora rubens*:—*natural size*. 2. A portion *magnified*.

Plate CCCXLVII. *C.*

MELOBESIA VERRUCATA, *Lamour.*

Melobesia *verrucatà*; thin, expanded, irregularly lobed, pallid, dotted over with innumerable, small, pimply ceramidia.

Hab. With the preceding.

Descr. *Patches* from a quarter to half an inch in length, oblong, variously lobed at the margin, uneven. *Ceramidia* very numerous, minute.

C. Fig. 1. Melobesia verrucata :—*natural size.* 2. A portion *magnified.*

Plate CCCXLVII. *D.*

MELOBESIA PUSTULATA, *Lamour.*

Melobesia *pustulata*; thick, dull purple or green, oblong or lobed, incrusting, smooth; ceramidia numerous, large, rather prominent, conical.

Melobesia pustulata, *Lamour. Cor. Flex.* pl. 12. f. 2. *a.* B. *Kütz. Sp. Alg.* p. 696. *Harv. Man.* ed. 2. p. 109.

Hab. On *Phyllophora rubens* and other Algæ; common.

Descr. *Patches* often an inch or more in length, and half an inch broad, thickish, of irregular form, frequently lobed, closely adhering to flat surfaces or clasping cylindrical stems, the surface more or less uneven. *Ceramidia* several on each patch, clustered, of large size in proportion to those of other allied species, prominent, conical. *Colour*, when well grown, a dark, reddish purple, changing to green and finally to white.

D. Fig. 1. Melobesia pustulata :—*natural size.* 2. A portion *magnified.*

I have thought it best to figure these four reputed species on one plate, that the slight differences noticed between them may be seen.

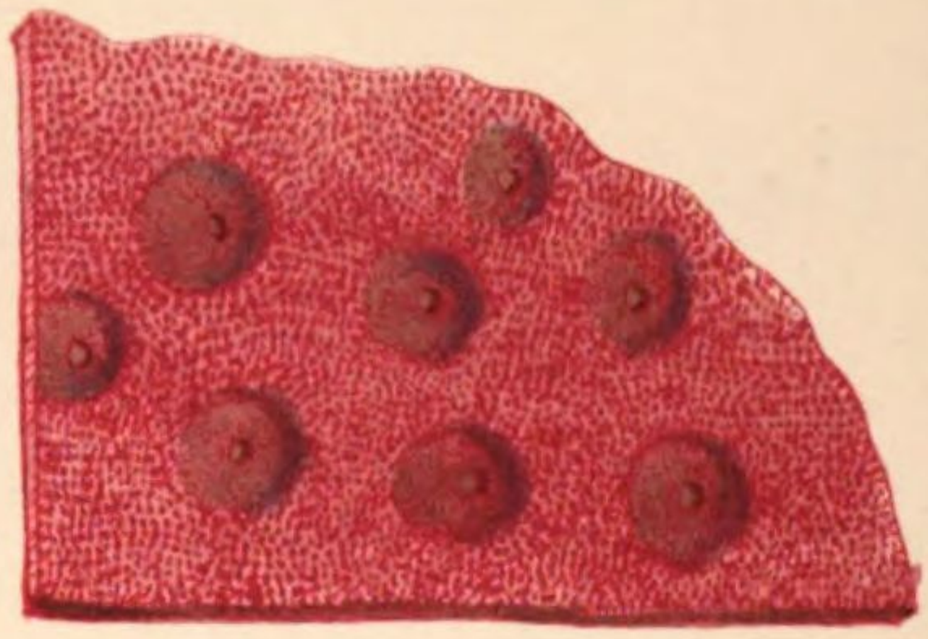


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PLATE CCL.

HILDENBRANDTIA RUBRA, *Meneg.*

GEN. CHAR. *Frond* cartilagineo-membranaceous, (*not stony,*) crustaceous, suborbicular, adhering by its lower surface; composed of very slender, closely packed, vertical filaments. *Conceptacles* immersed in the frond, orbicular, depressed, pierced by a hole and containing tetraspores and paraphyses at the base of the cavity. HILDENBRANDTIA (*Nardo*),—in honour of . . . . . ?

HILDENBRANDTIA *rubra,* Meneg.

HILDENBRANDTIA rubra, *Meneg. Mem. Riun. Nat. Padov.* 1841, p. 10. *Endl. 3rd Suppl.* p. 26. (*excl. Syn. Berk.*) *Kütz. Phyc. Gen.* p. 384. t. 78. f. V.

HILDENBRANDTIA Nardi, *Zanard. Alg. Adr.* p. 135.

RHODODERMIS Drummondii, *Harv. in Ann. Nat. Hist.* vol. xiv. p. 27. pl. 2.

HAB. On smooth stones and pebbles, between tide-marks, as well as in deep water. At all seasons? Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Frond* forming a thin, crustaceous expansion from half an inch to two inches or more in diameter, at first orbicular, and spreading in concentrically marked patches, but gradually sinuated and its surface irregularly corrugated as it advances in age; closely adhering by the whole of its under surface to the rock or stone on which it grows. A small portion viewed vertically with the microscope shows innumerable dot-like cells, imbedded in a clear, firm, gelatine: and thin slices, viewed laterally, prove the crust to be formed of very densely set, and closely cohering, slender filaments, composed of minute cells. When in fruit the surface is pitted with disc-like depressions, pierced in the centre by a hole which communicates with a chamber or immersed conceptacle hollowed out of the frond, and containing a few oblong, zoned tetraspores, among a number of paraphyses or abortive filaments. The part of the frond forming the walls of the conceptacle is of a much paler colour than the rest. *Colour* varies, according to locality, from a clear blood-red to a dark red brown. *Substance* coriaceo-membranaceous, very firm.

Common all round the coast, on stones and rocks within tide-marks, and also often dredged from deeper water. It forms a thin skin-like film, so closely applied to the surface of the body on which it grows that it is impossible to remove a specimen

without laceration. Its colours are sometimes much brighter than at others, especially (as observed by Dr. Drummond) in places where it is exposed to the dripping of fresh water.

The affinity of this obscure plant is rather doubtful, and I am by no means satisfied with the position which I have now assigned to it, next the *Nullipores*. It differs from those vegetables in wanting the lime which forms so remarkable a portion of their solid contents; but its cellular structure is not very unlike that of a *Nullipore*, and there is a near resemblance in the fructification. The cells composing the frond in the *Nullipores* or *Melobesiæ*, are longer and narrower than those of the *Hildenbrandtia*, but arranged in an order nearly similar.

Kützing (Phyc. Gen. p. 384) makes three species; *H. sanguinea*, *H. rosea*, and *H. Nardi*, which to judge by the author's diagnoses, differ from each other merely in colour;—the first being "*ferrugineo-sanguinea*," the second "*coccineo-rosea*," and the third "*lutescenti-fusca, siccitate nigrescens.*" This last may possibly be our *Ralfsia*.

I am not acquainted with the writings of the botanist to whom this genus is dedicated.

Fig. 1. HILDENBRANDTIA RUBRA, on a stone:—*natural size.* 2. Portion of the frond, with disc-like depressions. 3. Section of the same, cut through a conceptacle. 4. Tetraspores:—*all magnified.*

2.

PLATE CLXVI.

LITHOCYSTIS ALLMANNI, *Harv.*

GEN. CHAR. "Plant calcareous, consisting of a single plane of cellules, which are disposed in radiating dichotomous series forming an appressed flabelliform frond." *Allm.* LITHOCYSTIS (*Allm.*),—from λιθος, a *stone*, and κυστις, a *bladder*; because the cells are coated with a stony membrane.

LITHOCYSTIS *Allmanni.*

HAB. Parasitical on *Chrysymenia clavellosa*, from an Oyster-bed, Malahide, Dublin Bay, *Professor Allman.*

GEOGR. DISTR. —— ?

DESCR. "This minute Alga presents itself to the naked eye in the form of very small whitish dots scattered over the surface of the vegetable, which it has selected for its parasitic growth. Under the microscope each dot is seen to consist sometimes of one, but more frequently of a cluster of several transparent and colourless flabelliform fronds, whose component cellules radiate from the apex of the frond, and after repeated dichotomous division, terminate by forming a convex margin. In almost all the cells there may be seen a very evident sphærical nucleus. The whole plant is brittle, and pulverisable under pressure, its hyaline frond being mainly composed of carbonate of lime, which does not merely incrust it, but is intimately incorporated with its tissues. In *Lithocystis*, indeed, the carbonate of lime would seem in every way to represent and replace the silica of the *Diatomaceæ*. Under the action of dilute acid the mineral matter is entirely dissolved, and nothing remains but an exceedingly delicate organic film, in which the original form of the plant can with difficulty be detected. Nothing distinctly referable to fructification has been seen in any of the specimens examined. *Lithocystis* manifestly approximates very closely to *Coleochæte*, a genus established by Brebisson for a fresh-water Alga, and one with which the *Phylactidium* of Kützing is evidently identical. Setting aside the sheathed bristles of *Coleochæte*—a character by no means constant—*Lithocystis* would appear to differ from the latter chiefly by its calcareous composition, a feature, however, of much importance, and plainly bringing the present plant into direct relation with the Corallines." *Allm.*

In one of the best books of the last generation written for the amusement and instruction of young persons,—I mean *Evenings at Home*,—there is an excellent paper, headed "Eyes and no Eyes, or the Art of Seeing." The history of the discovery of the curious and beautiful little plant here figured reminds me of that paper, offering, as it does, a striking illustration of the advantage to a naturalist of having his eye constantly on the watch. My

friend Professor Allman, who omits no opportunity of adding an unobserved fact or a new member to biological science, noticed that an oyster-shell (found on a supper-table) was infested by some animal and vegetable parasites; among others, by some poor looking specimens of *Chrysymenia clavellosa*. On looking a little closer at these latter, he spied, what few but an observer so lynx-eyed would have discovered, some minute white dots, irregularly placed on the surface of the fronds. These he deemed worthy of examination, and laid aside the oyster-shell for that purpose. On submitting a fragment of the dotted *Chrysymenia* to the microscope the following day, the first trial rewarded him with a sight of the delicate, glassy fan which is here copied from his drawing. I have added a representation of the oyster-shell, as a memento of the discovery; recommending to all botanical oyster-eaters to make a similar use of their eyes.

The aspect of this little parasite is strikingly similar to that of a *Coleochæte*, but the calcareous nature of the cellular membrane seems to point to a different affinity. In the absence of information respecting its fructification, I can form but a guess as to the family in which it may most properly be arranged. In suggesting the *Corallineæ* I am chiefly guided by the calcareous tissue: the *habit*, indeed, is not unlike that of some of the minute *Melobesiæ*. The *structure* is much more simple, and, taking into account the stony nature of the cells, sufficiently peculiar to justify the formation of a new genus for the reception of this organism. For the genus Dr. Allman has suggested the appropriate name *Lithocystis*, and it affords me great pleasure to add the specific name *Allmanni*.

Fig. 1. An old oyster-shell, with various animal and vegetable parasites: *Lithocystis Allmanni*, forming white specks on the frond of *Chrysymenia clavellosa*.
2. LITHOCYSTIS ALLMANNI:—*highly magnified*.

Reeve, Benham & Reeve, imp.

PLATE CLI.

DELESSERIA SANGUINEA, *Lamour.*

GEN. CHAR. *Frond* rose-red, flat, membranaceous, with a percurrent mid-rib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*), immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Lamour.*),—in honour of *Baron B. Delessert*, a distinguished Botanist and Patron of Botany.

DELESSERIA *sanguinea*; stem cylindrical, cartilaginous branched, bearing oblong or obovate, transversely veined leaves, entire at the margin; mid-rib percurrent, strong; lateral veins opposite; tubercles stalked, attached (in winter) to the membraneless mid-ribs of old leaves; tetraspores densely aggregated in small *sporophylla*, (produced in winter) on old mid-ribs.

DELESSERIA sanguinea, *Lamour. Ess.* p. 124. *Lyngb. Hyd. Dan.* p. 7. t. 2. *Ag. Sp. Alg.* vol. i. p. 172. *Ag. Syst.* p. 248. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 292. *Grev. Alg. Brit.* p. 72. *Hook. Br. Fl.* vol. ii. p. 285. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* p. 55. *Wyatt, Alg. Danm.* no. 13. *Endl. 3rd Suppl.* p. 53. *Kütz. Phyc. Gen.* p. 445. t. 67.

WORMSKIOLDIA sanguinea, *Spr. Syst. Veg.* vol. iv. p. 331.

FUCUS sanguineus, *Linn. Syst. Nat.* vol. ii. p. 718. *Lightf. Fl. Scot.* vol. ii. p. 942. *Huds. Fl. Ang.* p. 573. *Stack. Ner. Brit.* t. 7. *Turn. Syn.* vol. i. p. 7. *Turn. Hist.* t. 36. *E. Bot.* t. 1041.

HAB. In deep rock pools, between tide-marks, generally at the shady side of the pool, under projecting ledges of rock. Biennial. Fruiting in winter. Common on the British coasts, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea. A variety found by Dr. Hooker at Hermite Island, Cape Horn.

DESCR. *Root* a hard, conical disc. *Stem* cartilaginous, from one to six or eight inches, or more in length, more or less branched, one to three lines in diameter, nearly cylindrical or variously swollen and mis-shapen, producing on all sides, throughout its length, numerous, irregularly placed leaves. *Leaves* shortly petiolate, from four to eight or ten inches in length, and from one to four or five in breadth, tapering at base, oblong or obovate, obtuse or more or less acute, sometimes lanceolate, when young nearly flat or scarcely undulate, when old very much waved; the margin perfectly entire. *Mid-rib* strong, from half a line to more than a line in diameter, gradually attenuated upwards, pinnated with lateral, patent or subhorizontal, opposite nerves, issuing at short and equal distances, and proceeding towards the margin. Occasionally the leaf is divided in a manner between palmate and pinnate into several deep undulated lobes, whose apices are again lobed; and segment traversed by a branch of the mid-rib, which is likewise pinnated with opposite nerves. *Fructification* of both kinds produced in winter on the mid-ribs of old leaves, which have lost their mem-

brane; 1, spherical *tubercles*, borne on little stalks, mostly along one side of the mid-rib, containing a profusion of ovate spores; 2, obovate sporophylla, densely clothing the mid-rib, and thickly covered with a stratum of minute tetraspores. *Substance* of the leaves delicately membranous, their surface glossy and shining. *Colour* a fine crimson pink. It adheres to paper in drying.

This fine plant, whether we regard the splendour of its colour or the elegance of its form, is entitled to high rank in the Oceanic Flora, and notwithstanding its common occurrence on all our shores, is never seen without attracting admiration. In favourable localities it reaches to a very large size, the length and breadth of its leaves greatly exceeding what our plate represents, and such specimens are among the most beautiful vegetable objects in nature. It therefore worthily commemorates, as the type of the genus to which it belongs, the services rendered to Botany by one of her most distinguished votaries, whose recent loss will long be severely felt, and whose place in the wide circle of which he was the centre, can never be supplied.

The variety with *lobed* leaves, mentioned in the description, was sent to me by the Rev. D. Landsborough, who gathered it on the coast of Ayrshire. It is a very curious form, showing a tendency towards *D. sinuosa*, from which, in colour and other respects, it widely differs. It has also a considerable likeness to *D. Davisii*, a plant of the Southern Hemisphere, but in that species the lateral nerves are *alternate*, not *opposite*; a character which appears to be constant. Another variety, which I have from the Baltic, has exceedingly narrow, lanceolate leaves, and, until closely examined, might pass for a form of *D. Hypoglossum*. I have seen no British specimens like it.

Dr. Hooker found at Cape Horn, two states of this species, one resembling our British plant, except that each leaf was eighteen inches in length! and proportionably broad; the other with lanceolate leaves, from whose mid-ribs innumerable minute leaflets spring. This last was only found in a young state, and may possibly belong to a distinct species, which should be called *D. Hookeri*.

Fig. 1. DELESSERIA SANGUINEA:—*of the natural size.* 2. Old mid-rib, with sporophylla; *natural size.* 3. A sporophyllum. 4. Tetraspores; *both magnified.* 5. Old mid-ribs, with tubercles; *natural size.* 6. A tubercle. 7. Spores; *both magnified.*

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W H.H. del et lith.

R.B. & R. imp.

PLATE CCLIX.

DELESSERIA SINUOSA, *Lamour.*

GEN. CHAR. *Frond* rose-red, flat, membranaceous, with a percurrent mid-rib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores*, forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Lamour.*),—in honour of *Baron B. Delessert*, a distinguished botanist and patron of Botany.

DELESSERIA *sinuosa*; stem elongated, branched, beset with oblong or ob-ovate, deeply-sinuated or pinnatifid, toothed, transversely-ribbed leaves.

DELESSERIA sinuosa, *Lamour. Ess.* p. 124. *Lyng. Hydrop. Dan.* p. 7. t. 2. *Ag. Sp. Alg.* vol. i. p. 174. *Ag. Syst.* p. 248. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 292. *Grev. Alg. Brit.* p. 73. *Hook. Br. Fl.* vol. ii. p. 285. *Wyatt, Alg. Damn.* no. 62. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* ed. 1. p. 55. *Endl. 3rd Suppl.* p. 53.

WORMSKIOLDIA sinuosa, *Spreng. Syst. Veg.* vol. iv. p. 331.

FUCUS sinuosus, *Good. and Wood. in Linn. Trans.* vol. iii. *Eng. Bot.* t. 822. *Turn. Syn.* p. 1. *Turn. Hist.* t. 35.

FUCUS crenatus, *Gm. Hist. Fuc.* p. 184. t. 24. f. 4. *Linn. Syst. Gm.* p. 1388.

FUCUS rubens, *Huds. Fl. Ang.* p. 573. *Lightf. Fl. Scot.* p. 943. *Stack. Ner. Brit.* p. 18. t. 7.

FUCUS roseus, *Fl. Dan.* t. 652.

FUCUS Palmetta, varietas, *Esper, Ic. Fuc.* vol. i. p. 84. t. 42.

HAB. Parasitical on the stems of *Laminaria digitata*; also attached to various substances in deep water. Perennial. Summer and autumn. Common on the British shores.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* a small disc. The frond originates in an oblong or obovate, deeply sinuated, or pinnatifid leaf, four to six inches in length, and from one to four inches in breadth, furnished with a strong, percurrent midrib, pinnated with secondary, opposite nerves, one of which runs to the apex of each lacinia of the frond. As the growth of the plant proceeds, the laciniæ become deeper and deeper, and at length the cutting between each reaches the mid-rib; and at the same time the margins of each lacinia become first toothed and then incised, while lesser opposite nervelets are given off to the marginal teeth by their primary nerve. At this stage the midrib of of the first-formed leaf has become a stem pinnated with a great number of leaves, of similar form and structure to what the first leaf had been; and at a further period various irregularities of branching, some caused by laceration, some by proliferous growth, take place, till there results a much branched stem, well clothed with pinnatifid leaves. The margin is sometimes slightly toothed, and sometimes cut into very slender processes, or cilia; and not uncommonly, when the plant vegetates at a depth of 6–10 fathoms,

every lacinia is drawn out at the apex into tendrils, and the depauperated lamina very much cut into narrow, jagged processes. *Tubercles* solitary, either seated on the nerves of the leaf, or borne on little leaflets rising from the nerve, depressed, containing a tuft of beaded filaments, finally resolved into spores. *Tetraspores* in oblong or linear marginal sori, formed at the apices of the lateral nerves, often confined to the slender, marginal processes. *Colour*, a beautiful purplish crimson or lake. In drying, the frond adheres to paper.

Next to *D. sanguinea* (Tab. CLI.) this, when well grown, and of large size, is one of the handsomest of the genus. Our plate represents the frond in rather a young state, a specimen having been chosen for figuring which exhibits the changes that take place in form during the growth of the frond. At first the plant consists of a simple, penninerved leaf sinuated at the margins. The sinuosities gradually deepen into lateral lobes; and these lobes, as is shown in the lower part of the figure, deepen into branches, or new fronds, at first sinuous, then lobed and at length divided like the fronds from which they grow. Thus, eventually, a much branched and leafy frond results from the original leaf, by regular growth and subdivision of the margin. When any vigorous part is wounded, an irregular, proliferous growth likewise takes place, new leaflets springing from any part of the midrib. Sometimes the margin is much laciniated.

D. sinuosa is abundant throughout the Northern Atlantic. In the Southern Ocean it is represented by *D. quercifolia* and *D. Lyallii*, two very beautiful species which resemble it closely in form and mode of growth, but which are essentially different.

Fig. 1. A young and vigorous frond of DELESSERIA SINUOSA. 2. Leaf from an old frond, of the cut variety, with sori of tetraspores in the marginal lobes:—*both of the natural size.* 3. Marginal lobe with tubercle. 4. Section of the tubercle. 5. Strings of spores, from the same. 6. Marginal lobe, with sorus, formed out of the apex of the nerve. 7. Tetraspore. 8. Portion of the surface:—*all magnified.*

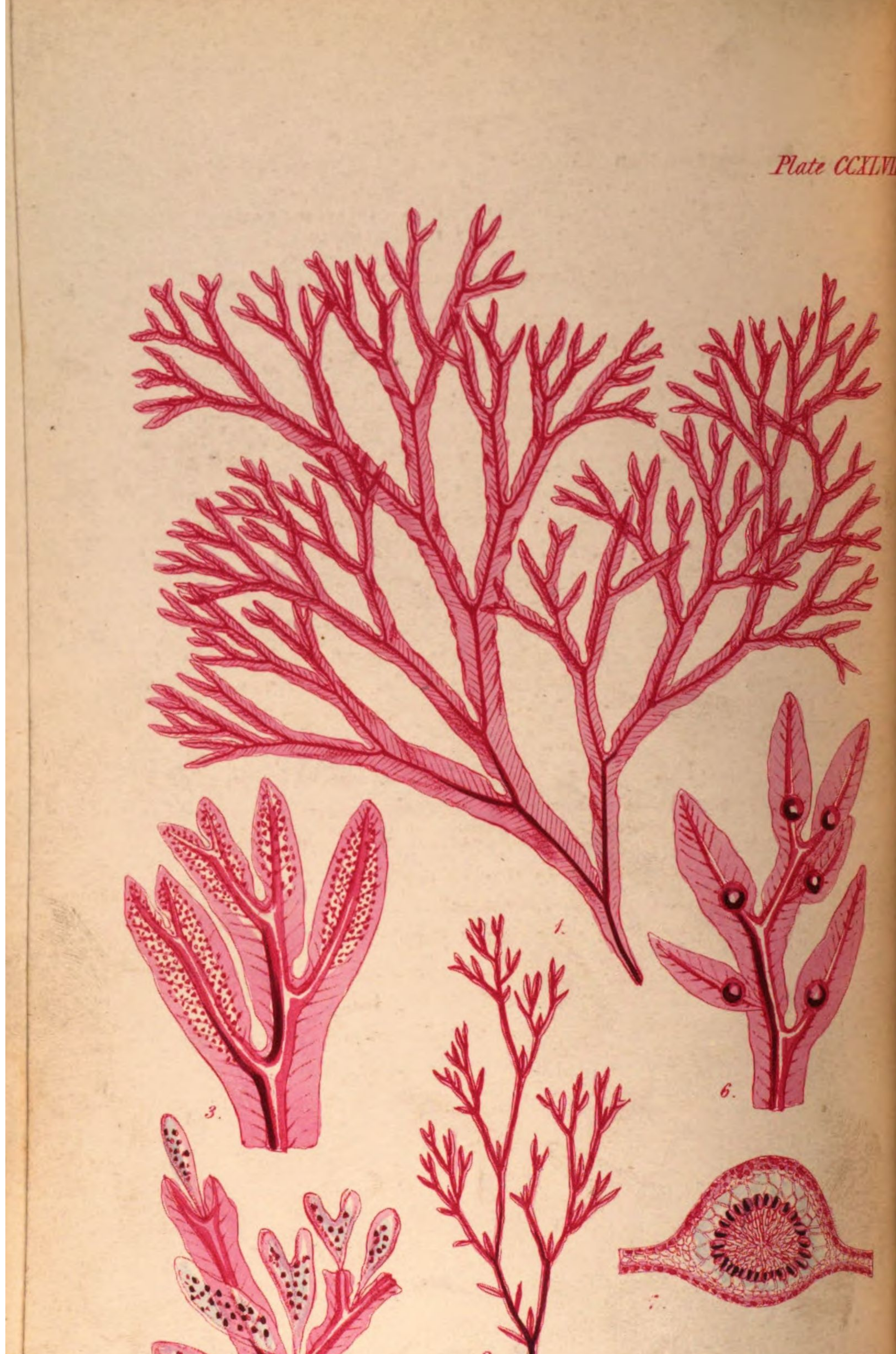

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PLATE CCXLVII.

DELESSERIA ALATA, *Lamour*.

GEN. CHAR. *Frond* rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular tuft of angular spores; 2, *tetraspores*, forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Lamour.*),—in honour of Baron B. Delessert, a distinguished botanist and patron of Botany.

DELESSERIA *alata*; stem dichotomous, much branched, winged throughout with a narrow, membranous lamina which is pennate-nerved; tubercles rising from the midrib; tetraspores in sori occupying the apices of the frond, or in proliferous leaflets.

DELESSERIA alata, *Lamour. Ess.* p. 124. *Lyngb. Hyd. Dan.* p. 8. t. 2. *Ag. Sp. Alg.* vol. i. 178. *Ag. Syst.* p. 250. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 293. *Grev. Alg. Brit.* p. 73. *Hook. Brit. Fl.* vol. ii. p. 285. *Wyatt. Alg. Damn.* No. 14. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* p. 55.

WORMSKIOLDIA alata, *Spreng. Syst. Veg.* vol. iv. p. 293.

HYPOGLOSSUM alatum, *Kütz. Phyc. Gen.* p. 445.

FUCUS alatus, *Huds. Fl. Ang.* p. 578. *Gmel. Hist.* p. 187. t. 25. f. 1. *Linn. Mant.* p. 135. *Syst. Nat.* p. 718. *Lightf. Fl. Scot.* p. 951. *Fl. Dan.* t. 352. *Stack. Ner. Brit.* t. 13. *Esper. Ic. Fuc.* vol. i. p. 20. t. 3. *Turn. Syn.* p. 144. *Turn. Hist.* t. 160. *E. Bot.* t. 1837.

HAB. On rocks and the larger Algæ, between tide-marks and in 4–10 fathoms water. All round the British Coasts.

GEOGR. DISTR. Atlantic shores of Europe and North America.

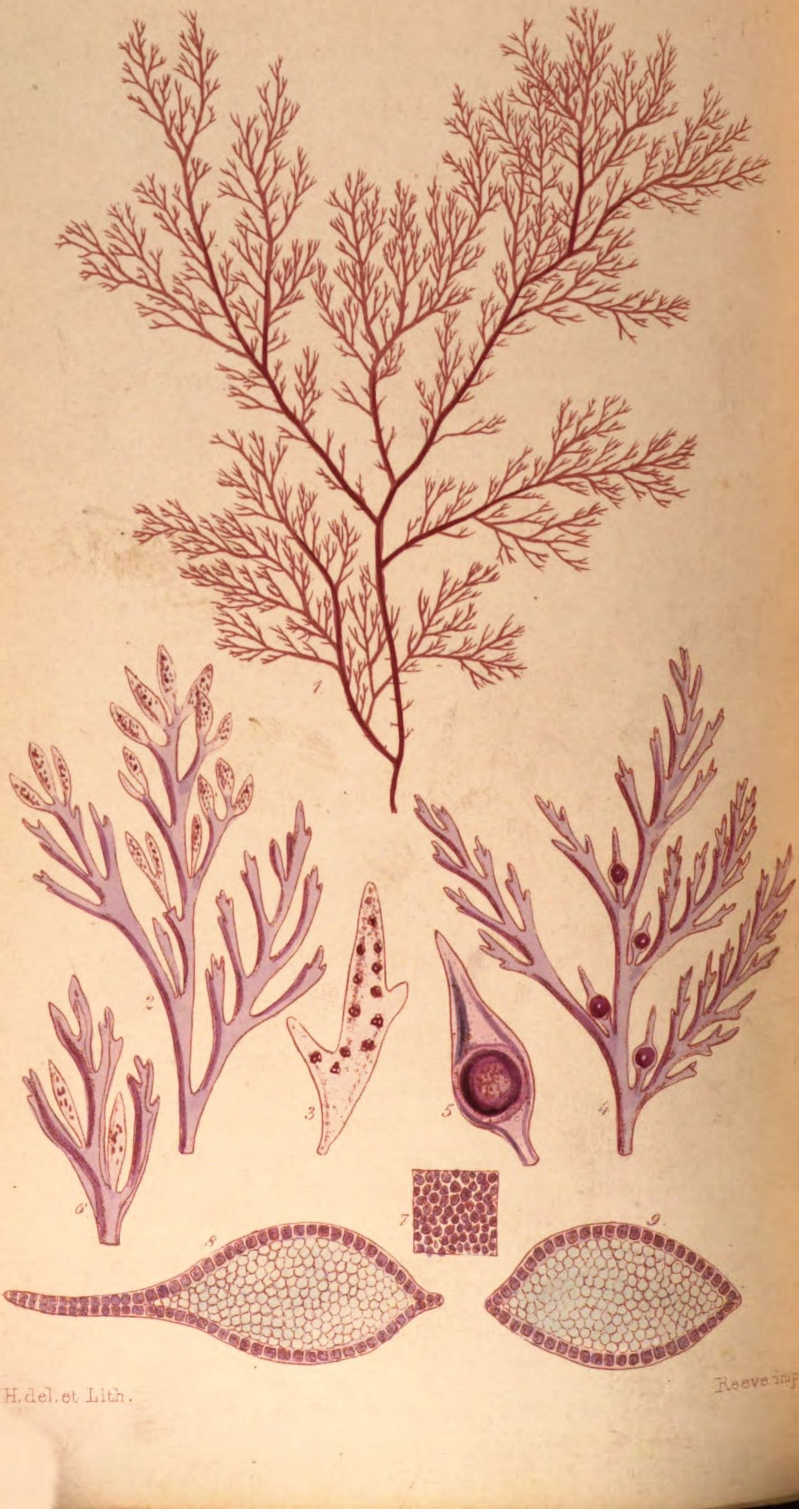
DESCR. *Root*, a small disc. *Frond*, 4–8 inches high, 1–4 lines in breadth, very much branched in a more or less regularly dichotomous manner; the main divisions being frequently alternate, or almost pinnately disposed, the minor ones regularly and repeatedly forked. *Branches* gradually narrower to the tips, consisting of a strong percurrent midrib or stem bordered with a flat, wing-like lamina, which follows all the divisions, but is usually broader at one side of the rib than at the other, especially toward the axils, where there is a deep, rounded sinus. This is most obvious on broad varieties. Every part of the membrane is furnished with opposite, patent veinlets connecting the midrib with the margin of the lamina, and themselves connected by pellucid striæ. Normally the frond is perfectly distichous, all the branches extending in one plane; but old specimens are very frequently beset with crowded, irregularly inserted branchlets, issuing from all parts of the midrib proliferously; such plants are excessively bushy. *Tubercles*

immersed in the midrib, towards the tips of the branches, very convex. *Tetraspores* either contained in terminal sori, disposed at each side of the rib; or else in proper leaflets, irregularly grouped about the apices. *Colour*, in well grown specimens, a clear, deep crimson, varying to dark full red, and sometimes brownish. *Substance* membranaceous, adhering to paper. The cells of the frond are small and close, for the genus.

One of our commonest species; and though not without beauty, yet one of the least attractive of the genus to which it belongs. When well grown, with a broad wing to the stems, as in the specimen selected for our upper figure, its claims to the possession of considerable beauty and grace will readily be admitted, but in average specimens the wing-like margin is much more narrow and is very liable to injury; the colour darker and more dingy; and the ramification less regularly dichotomous. Sometimes, from proliferous growth, the whole upper part of the frond is thick and bushy.

Under Pl. LXXXIII. of the first volume will be found a statement of my views respecting the claims of *D. angustissima* to specific rank,—claims, which I did not then admit, and which I am not now disposed to do. That supposed species I can only regard as a very narrow and aberrant form of the present plant, having either no membrane developed, or a very imperfect one. Were it true that no membrane was ever found in *D. angustissima*, then we should have an *absolute* character on which to found a species. But such is not the case, for I have specimens in which the commencement of membrane is evident on some of the branches, while other parts, equally perfect, are destitute of membrane. I consider *D. angustissima* therefore to be an extreme variety of *D. alata*, analogous to the narrow states of such plants as *Chondrus crispus*.

Fig. 1. DELESSERIA ALATA; A broad variety. 2. Narrow variety:—*both the nat. size.* 3. Apex of branch with tetraspores. 4. Apex with the same, contained in proper leaflets. 5. A tetraspore. 6. Apex with tubercles. 7. Section of a tubercle. 8. Portion of the lamina and midrib:—*magnified.*



W.H.H. del. et Lith.

Reeve imp.

PLATE LXXXIII.

DELESSERIA ANGUSTISSIMA, *Griff. MSS.*

GEN. CHAR. *Frond* rose-red, flat, membranaceous,* with a percurrent midrib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Ag.*),—in honour of *Baron Benj. Delessert*, a distinguished botanist and patron of botany.

DELESSERIA *angustissima*; frond membranaceo-cartilaginous, compressed, very narrow, two-edged, much branched; branches alternate, distichous of unequal length, much divided above, and furnished with numerous forked ramuli; tubercles imbedded either in the tips of the frond, or in small axillary ramuli; tetraspores forming sori (on distinct plants) either in the inflated apices, or in axillary, lanceolate ramuli.

DELESSERIA alata, γ. angustissima, *Ag. Sp. Alg.* vol. i. p. 179. *Ag. Syst.* p. 250. *Grev. Alg. Brit.* p. 74. *Hook. Br. Fl.* vol. ii. p. 286.

DELESSERIA alata, β. angustifolia, *Lyngb. Hyd. Dan.* p. 8. (?)

RHODOMENIA rostrata, *J. Ag. MSS.*

GIGARTINA purpurascens, γ. rostrata, *Lyngb. Hyd. Dan.* p. 46. t. 12. *fide J. Ag.* (but the figure is not characteristic).

GELIDIUM? rostratum, *Griff. in Harv. Man.* p. 82.

FUCUS alatus, γ. angustissimus, *Turn. Syn. Fuc.* vol. i. p. 145. *Turn. Hist.* t. 160. fig. *k–l.*

FUCUS alatus, junior, *Gm. Hist.* t. 25. f. 2.

HAB. Parasitical on the stems of *Laminaria digitata*, often accompanying *Del. alata*. Perennial. Winter and Spring. Scarborough, *Mr. Pitchford*. Lossiemouth, Morayshire, *Mr. Brodie*. Aberdeen, *Dr. Dickie*. Orkney, *Rev. J. H. Pollexfen*. Galway, *Mr. Reilly*. Cornwall, *Mr. Ralfs*. Kingstown, *Mr. Andrews*.

GEOGR. DISTR. Arctic Sea, and Northern Atlantic Ocean. Greenland. Norway?

DESCR. *Root*, a small disc. *Fronds* tufted, 4–8 inches long, nearly cylindrical below, compressed and two-edged above, not half a line in diameter, becoming gradually more slender towards the tips, much and irregularly branched. *Branches* distichous, irregular, alternate or subdichotomous, frequently bare of ramuli in their lower part; above more or less amply furnished with patent, once or twice forked, ramuli from a quarter to half an inch in length. *Apices* acute. *Colour* a very dark red. *Substance* cartilaginous, rather flaccid. *Fructification*; 1, *tubercles* mostly immersed in small accessory ramuli, springing from the axils of the upper branches, spherical, containing a moderately dense mass of spores, sometimes immersed in the apices of the frond. 2, *tetraspores* contained in the inflated tips of the branches, or in small, simple or forked, spindle-formed, accessory ramuli, seated in the axils of the upper branches.

* In this species the *membrane* is obsolete, the frond consisting altogether, or very nearly, of midrib.

It is nearly forty years since Mr. Brodie first noticed the plant here figured, and sent specimens to Mr. Turner, by whom they were then considered to be a variety, which he called *angustissima*, of *Delesseria alata*; and in this judgment he was generally followed till the year 1840, when, in deference to the repeated protests of Mrs. Griffiths, I ventured, in the 'Manual,' to separate and describe Mr. Brodie's plant under the temporary name of *Gelidium ? rostratum*, recommending it to the notice of observers, and adding that "my own opinion on this puzzling matter was not very decided."

Were all the specimens now before me equally characteristic as the one I have figured, I should have no hesitation in adding mine to the other opinions in favour of this plant; but unfortunately I possess some, in which I can clearly trace the compressed edge of the frond passing into a very narrow membrane; and others which seem to be exactly intermediate between very narrow *alata*, and true *angustissima*. I am therefore now persuaded that Mr. Turner's judgment was strictly correct; and Dr. Dickie, who has had the best opportunities of studying it in its living state, writes, "Both plants grow together upon *Lam. digitata*; both are in fruit at the same time; and in making up packets of duplicates I have often been puzzled whether to call my specimens *G. rostratum* or *D. alata*."

Mrs. Griffiths, however, adheres to her already recorded opinion. "I have always", she says, "acted on the maxim of my first instructor, Bishop Goodenough, who in one of his early letters wrote, '*never let what I or any one else may say weigh against the evidence of your own senses*'; therefore, when I see the young, tender and perfect shoots of one plant furnished with a membrane, however bare the rest of the plant may be, and the equally young and tender shoots of another perfectly naked, though some of the branches are compressed, I must decide that they are not the same species, particularly as the difference has been constant for so many years." Whichever opinion be eventually adopted, it must at least be acknowledged that *D. angustissima* is a very *remarkable form*, and as such deserving of a place in this work.

Fig. 1. DELESSERIA ANGUSTISSIMA:—*of the natural size.* 2. Portion of a branch with tetraspores. 3. An axillary ramulus, with the same. 4. Portion of a branch with tubercles. 5. An axillary ramulus containing a tubercle. 6. Portion of a branch with the commencement of a winged margin:—*all magnified.* 7. Fragment of the surface of the frond. 8, 9. Transverse sections of different specimens:—*highly magnified.*

Plate II.

PLATE II.

DELESSERIA HYPOGLÒSSUM, *Ag.*

GEN. CHAR. *Frond* rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular seeds; 2, *granules* (*tetraspores*) forming defined spots in the frond, or in leaf-like processes.

DELESSERIA *Hypoglossum*; *frond* linear-lanceolate, tapering at each end, repeatedly proliferous from the midrib, with leaflets of similar form; tubercles on the midribs of the smaller leaflets; granules forming linear spots at each side of the midrib.

DELESSERIA Hypoglossum, *Ag. Sp. Alg.* vol. i. p. 176. *Syst.* p. 249. *Grev. Fl. Edin.* p. 293. *Alg. Brit.* p. 75. t. 12. *Hook. Br. Fl.* vol. ii. p. 286. *Mack. Fl. Hib.* vol. iii. p. 191. *Harv. Man.* p. 56. *Wyatt. Alg. Danm. no.* 63. *J. Ag. Medit.* p. 157. *Endl. 3rd Suppl.* p. 52. *Montag. Pl. Cell. Canar.* p. 150.
DELESSERIA Hypoglossum, *Lamour. Ann. Mus.* xx. p. 124.
WORMSKIOLDIA Hypoglossum, *Spreng. Syst. Veg.* vol. iv. p. 331.
HYPOGLOSSUM Woodwardii, *Kütz. Ph. Gen.* p. 444. t. 65. f. 1.
FUCUS Hypoglossum, *Woodw. in Linn. Trans.* vol. ii. p. 30. t. 7. *Linn. Trans.* vol. iii. p. 113. *With.* vol. iv. p. 95. *Eng. Bot.* t. 1396. *Turn. Syn. Fuc.* vol. i. p. 17. *Hist.* t. 14. *Esp. Ic. Fuc.* vol. ii. p. 17. t. 120.
FUCUS hypoglossoides, *Stack. Ner. Brit.* p. 76. t. 13.
ULVA lingulata, *De Cand. Fl. Fran. 2nd edit.* vol. ii. p. 14.

HAB. In the sea, on rocks and Algæ. Annual. Summer. Frequent on the shores of England and Ireland; rare in Scotland.

GEOGR. DISTR. Atlantic shores of Europe, frequent. Rare in the Mediterranean, and of small size. Canary Islands, *Webb*.

DESC. *Root*, a minute disc. *Fronds* tufted, consisting of a primary leaf 2–8 inches in length, and from a line to half an inch in breadth, linear-lanceolate, rose-red and membranous, with a distinct midrib, and faint traces of obliquely transverse striæ, throwing out from its midrib numerous similar leaves, which again produce others, until the plant becomes exceedingly bushy and of a globular figure. The apices of the leaflets are more or less tapering or acute. If placed in fresh water the colouring matter is soon discharged. The tubercles are globose, forming a dark-red swelling in the substance of the midribs of the smaller leaflets, generally about their crentre, and contain a large number of minute seeds; and the granules form linear patches along the midribs of the leaves of distinct, and generally more luxuriant, plants.

Our figure, which represents a larger state of the plant than is commonly met with, though by no means the largest we have

seen, is taken from a specimen collected by the late Miss Hutchins in Bantry Bay. In that favoured locality and in other situations on the west coast of Ireland, and also at Larne near Belfast on the north-east coast, very luxuriant specimens are often met with in company with others as narrow and bushy as are commonly seen on the south coast of England. It varies indeed greatly in size, the frond being sometimes scarcely a line in width, sometimes nearly half an inch; but its admirable distinguishing character, that of being repeatedly proliferous from the midrib, is invariable. The only British plant with which a young botanist can confound it, is the somewhat rarer *D. ruscifolia*, from which its thinner substance, brighter colour, proportionally narrower leaves, and the lanceolate, not linear-oblong, form of the leaflets distinguish it.

The first notice of the species was by Dr. Solander who named a specimen in the Banksian Herbarium, the native country of which was unknown. Mr. Wigg having about the year 1794 found it on the Norfolk shores, it was published in the 'Linnæan Transactions,' as a British plant, and is now well known to occur in tolerable plenty on most of the European coasts. I have not seen any American specimens, nor is it found in the Southern Ocean. A species does indeed occur on several of the Antarctic Coasts, as at Auckland Island, Kerguelen's Land, Cape Horn and the Falkland Islands, which agrees in very many respects with *D. Hypoglossum*, having the same general habit, the same lanceolate leaves and the same proliferous growth; but in it (*D. crassinervia*, Mont) the midribs of the leaves are usually very much broader and thicker. I fear, however, that this character is not a very constant one, some Falkland Island individuals having a much less broad midrib than others, or than the original Auckland specimens, and I am almost disposed to regard the Southern plant as more properly a variety of the present species than specifically distinct.

Fig. 1. DELESSERIA HYPOGLOSSUM:—*natural size*. 2. Leaflet with tetraspores. 3. Section of ditto, showing part of the sorus. 4. Tetraspores separated. 5. Leaflet, with tubercles. 6. Section of ditto. 7. Tubercle removed. 8. Seeds from tubercle:—all *magnified*.

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Plate XXVI.

DELESSERIA RUSCIFOLIA, *Lamour.*

Gen. Char. *Frond* rose-red, flat, membranaceous, with a percurrent mid-rib. *Fructification* of two kinds, on distinct individuals: 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* forming defined spots in the frond, or in leaf-like processes. Delesseria—in honour of *Baron Benj. Delessert*, a distinguished Botanist and Patron of Botany.

Delesseria *ruscifolia*; frond linear-oblong, obtuse, repeatedly proliferous from the mid-rib with leaflets of a similar form; leaflets traversed by oblique, anastomosing, pellucid striæ; tubercles on the mid-ribs of the smaller leaflets; tetraspores forming linear spots at each side of the mid-rib.

Delesseria ruscifolia, *Lamour. Ess.* p. 124. *Ag. Sp. Alg.* vol. i. p. 175. *Ag. Syst.* p. 249. *Grev. Alg. Brit.* p. 76. *Hook. Br. Fl.* vol. ii. p. 286. *Harv. in Mack. Fl. Hib.* part 3. p. 192. *Harv. Man.* p. 56. *Endl. 3rd Suppl.* p. 53. *Mc'Calla, Alg. Hib.* no. 12.

Wormskioldia ruscifolia, *Spreng. Syst. Veg.* vol. iv. p. 331.

Hypoglossum ruscifolium, *Kütz. Phyc. Gen.* p. 444.

Fucus ruscifolius, *Turn. in Linn. Trans.* vol. vi. p. 127. t. 8. f. 1. *Syn. Fuc.* p. 11. *Hist.* t. 15. *Sm. Eng. Bot.* t. 1395.

Hab. Generally growing on rocks, near low water mark; sometimes parasitical on other Algæ. Annual. Spring, Summer, and Autumn. Not uncommon on the shores of England and Ireland.

Geogr. Distr. Atlantic shores of Europe. Cape of Good Hope, *W. H. H.* Van Dieman's Land, *Mr. Gunn.*

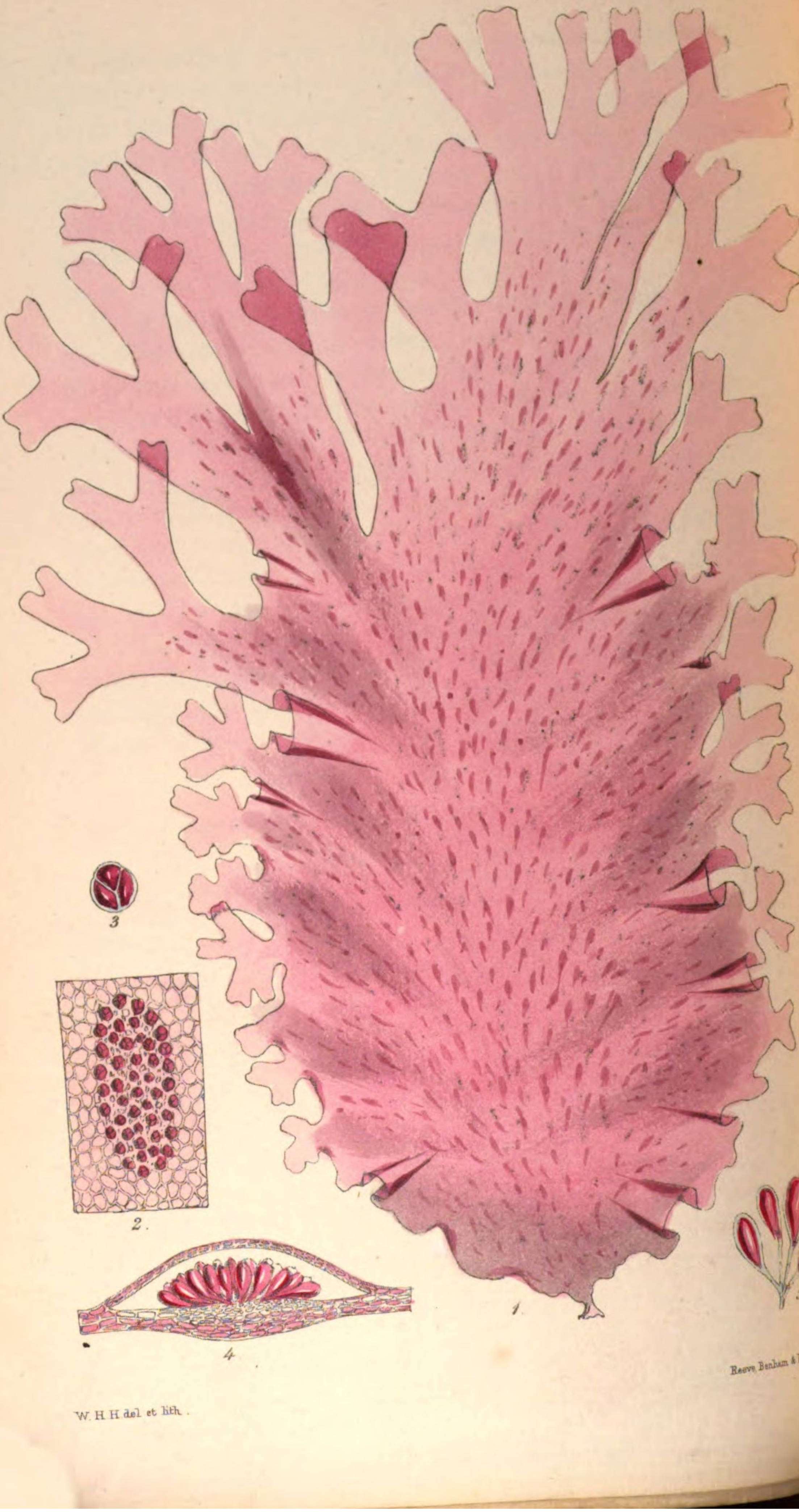
Desc. *Root* a small disc. *Fronds* several from the same base, consisting of a primary leaf 2–4 inches in length, about 4 lines in breadth, linear-oblong, obtuse, undivided, entire at the margin, but often somewhat wavy and curled, with a strong mid-rib, producing numerous other leaves in a proliferous manner, all of similar shape to the primary; and these again producing a third and fourth set, until there results a much branched frond. All the leaflets spring regularly from the mid-ribs of those first formed. The cellules composing the membrane of the leaves are very minute, angular and closely packed; but the substance is traversed with branching and anastomosing, pellucid, jointed striæ or veinlets, composed of a single string of elongated cellules, and running in an oblique direction, from the mid-rib to the margin. *Tubercles* seated on the mid-ribs, generally toward the apices of the younger leaves. *Sori* linear, elongated, forming interrupted lines at each side of the mid-rib. *Colour*, a transparent blood-red. *Substance* more rigid than in *D. Hypoglossum*.

Delesseria ruscifolia was discovered on the Yarmouth shore by

Mr. Dawson Turner, who "after having observed its characters for many successive years" published an excellent account of it in the 'Linnæan Transactions' in 1801. It has always since been regarded as a distinct species, though confessedly very closely allied to *D. Hypoglossum*, and is now known to occur in the southern Hemisphere, as well as along several of the European shores. Specimens which I have gathered at the Cape of Good Hope appear identical with British ones.

Mr. Turner, in the memoir alluded to, and in his subsequent works, has entered very fully into the points of difference between the present species and its nearest ally, *D. Hypoglossum*, figured in our first number. A comparison of the figures will make these differences obvious. In *D. Hypoglossum* the leaflets are lanceolate, tapering to each end, and generally, but not constantly, acute; in *D. ruscifolia* they are linear-oblong, much broader in proportion to their length, and always very blunt. But besides differences of form, which are not always constant, the cellules composing the membrane in the present species are much smaller, the substance denser and thicker, and the colour more intense than in *D. Hypoglossum*; while the confervoid striæ which traverse the leaves, and are readily seen in *D. ruscifolia*, are either very obscure or do not exist in *D. Hypoglossum*.

Fig. 1. DELESSERIA RUSCIFOLIA; with tetraspores. 2. The same, producing tubercles:—*natural size*. 3. a leaflet, with sori. 4. Portion of the same, showing the pellucid striæ. 5. Tetraspores. 6. Leaflets with tubercles. 7. Portion of the same. 8. Globule of spores, removed from tubercle. 9. Spores separated:—*all more or less magnified*.



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W. H H del et lith.

Reeve, Benham & Reeve imp.

PLATE CCII.

NITOPHYLLUM PUNCTATUM, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores*, grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM (*Grev.*),—corruptly formed from *nitor*, to *shine*, and φυλλον, a *leaf*.

NITOPHYLLUM *punctatum*; frond very thin and delicate, destitute of nervures, either regularly dichotomous, or cleft into two or three principal segments, whose margins are fringed with dichotomous lobes; axils rounded; spots of granules large, oblong, scattered over the whole surface of the frond.

NITOPHYLLUM punctatum, *Grev. Alg. Brit.* p. 79. t. 12. *Hook. Br. Fl.* vol. ii. p. 287. *Harv. in Mack. Fl. Hib.* part 3. p. 192. *Harv. Man.* p. 57. *Hook. fil. et Harv. Lond. Journ.* vol. vi. p. 403.

AGLAIOPHYLLUM punctatum, *Mont. Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 443.

WORMSKIOLDIA punctata, *Spreng. Syst. Veg.* vol. iv. p. 331.

DELESSERIA punctata, *Ag. Sp. Alg.* vol. i. p. 186. *Ag. Syst.* p. 252. *Hook. Fl. Scot.* part 2. p. 101. *Grev. Fl. Edin.* p. 294.

DELESSERIA ulvoides, *Hook. Fl. Scot.* part 2. p. 101.

FUCUS punctatus, *With. Br. Ar.* (Ed. 6) vol. iv. p. 120. *E. Bot.* t. 1575. *Turn. Hist.* t. 71.

FUCUS ulvoides, *Turn. Hist.* t. 80.

ULVA punctata, *Stack. in Linn. Trans.* vol. iii. p. 236.

Var. β. *ocellatum*; frond with a roundish outline, cleft nearly to the base, the segments repeatedly dichotomous, linear.

NITOPHYLLUM punctatum, β. ocellatum, *Harv. Man.* p. 57.

NITOPHYLLUM ocellatum, *Grev. Alg. Brit.* p. 78. *Hook. Br. Fl.* vol. ii. p. 286. *Wyatt, Alg. Danm.* no. 15. *J. Ag. Alg. Medit.* p. 156.

AGLAIOPHYLLUM ocellatum, *Mont. in Zanard. Saggio.*, &c. p. 46. *Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 443.

DELESSERIA ocellata, *Lam. Ess.* p. 125. *Ag. Sp. Alg.* vol. i. p. 187. *Ag. Syst.* p. 252. *Grev. Crypt.* t. 347.

WORMSKIOLDIA ocellata, *Spreng. Syst. Veg.* vol. iv. p. 331.

HALYMENIA ocellata, *Duby, Bot. Gall.* p. 945.

FUCUS ocellatus, *Lam. Diss.* t. 32.

FUCUS granateus, *Lam. Diss.* t. 33. f. 3, 4.

Var. γ. *crispatum*; frond thickish, cleft nearly to the base, the segments irregularly dichotomous, linear, with the margin strongly curled.

Var. δ. *Pollexfenii*; frond proliferous, the young segments broadly obovate, rounded, very entire, or bifid.

NITOPHYLLUM POLLEXFENII, *Grev. MSS. in Herb.*

Var. ε. *fimbriatum*; segments broadly obovate, fringed with narrow, forked processes.

HAB. Attached to various Algæ, in pools at the extremity of low-water mark; but, more abundantly, and of much larger size, beyond the tidal influence in 4–15 fathom water. Annual. Summer. Not uncommon on the British and Irish shores, in many localities, from Orkney to Cornwall. Exceedingly abundant and of great size on the coast of Antrim; and in Roundstone Bay, Galway. β. Torquay and Budleigh, *Mrs. Griffiths*. Penzance, *Mr. Ralfs*. Mount Edgecombe, *Rev. W. S. Hore*. Forres, *Mr. Brodie*. Bantry Bay, *Miss Hutchins*. γ. Kilkee, *W. H. H.* Roundstone Bay, *Mr. M'c Calla*. Mount Batten, *Mr. Rohloff*. δ. Orkney, *Rev. J. H. Pollexfen*. ε. Roundstone Bay, *Mr. M'Calla*.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea. Tasmania.

DESCR. *Root*, a small disc. *Fronds* growing in tufts, exceedingly variable in size and form, according to locality: commonly from four to twelve or even twenty inches in length, and as much in breadth; and occasionally measuring five feet in length, and three in breadth, variously divided. In some specimens the main frond is nearly simple, or but once forked, broadly obovate, or oblong, with the margin divided into numerous linear lobes, from half an inch to an inch in width, two or three inches long, once or twice forked, their ultimate lobes somewhat digitate. The margin of such specimens is so extended in proportion to the disc, as to form large undulations or folds, when the plant is floating in water; and when displayed on paper the parts lie over each other, rendering it difficult to display the form fully. The opposite to this form is found in our var. β, in which the whole frond is divided to the base into linear, dichotomous lobes, with a perfectly flat margin. In γ. the substance is thick, of a darker colour, brownish when dry; the frond is from half an inch to an inch broad, six or eight inches long, dichotomous, with the margin minutely, but strongly curled: δ. is also thicker than the usual form, cuneate at base, variously lobed, the lobes flat, broadly obovate, with a rounded margin; and it often has the appearance of sprouting from an old frond: ε. is much thinner than the others, without fruit, roundish, the margin cut into minute forked lobes, not a line in breadth. There are many other states, which connect these several varieties together. *Fructification* thickly scattered over the whole surface; *tubercles* as large as turnip-seed, hemispherical, containing a cluster of stalked, obovate spores. *Spots* of tetraspores large, a line or more in length, oblong, dark-red, containing numerous grains. *Substance* delicately membranaceous, closely adhering to paper, and glossy when dry. *Colour*, a fine rosy pink, generally well preserved in drying.

Plate CCII. Fig. 1. NITOPHYLLUM PUNCTATUM; a small plant, of the normal form:—*of the natural size*. 2. A *sorus*. 3. A *tetraspore* from the same. 4. Vertical section of a tubercle. 5. Tuft of spores from the same.

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W. H. H. del et lith.

Reeve, Benham & Reeve imp

PLATE CCIII.

NITOPHYLLUM PUNCTATUM; *vars.* β. γ. δ.

(For description, see last folio.)

I have thought it necessary, for the proper illustration of *Nitophyllum punctatum* to give two plates, showing some of the principal forms which this variable plant assumes. Some of these look so distinct that many authors regard them as separate species, and it is not without having carefully examined the subject and consulted a very extensive suite of specimens, that I have formed an opposite opinion.

At Plate CCII. is represented what I regard as the normal or typical form of the species. This varies much in size, and sometimes grows to the length of many feet, in which case the dichotomous lobes are often several inches in length, but their proportions, as respects the whole frond, are not much altered. Between this form and fig. 1. of PLATE CCIII. which represents our var. β, the *Nitophyllum ocellatum* of authors, there appears at first sight a considerable difference; the extreme and regular division of this variety, and the flatness of its margin, showing apparently well marked characters. But innumerable intermediate forms connect the two; so that Dr. Greville and Mrs. Griffiths, who formerly recognised two species, now regard *N. ocellatum* as merely an extreme state of *N. punctatum*.

Our var. γ (Pl. CCIII. fig. 2.) is in some degree an intermediate form, exhibiting the dichotomous division of one, with the curled margin of the other. At the same time, its thicker substance, dark colour, and the minute and close curling of the margin mark a distinct variety. This variety has a strong resemblance to *N. crispatum* of the Flora Antarctica, but differs in fructification, the spots of granules in that species being as minute, as in *N. Hilliæ*.

Our var. δ (Pl. CCIII. fig. 3.) is still another form. In this, the lobes, instead of being narrow and forked, are the widest

portions of the frond, and become singularly rounded and almost reniform. The outline of many specimens of this variety, which I have only seen in the Herbarium of Mr. Pollexfen, to whom I am indebted for the specimen figured, is very similar to that of *Kalymenia reniformis*. Like var. γ, its substance is thicker, and colour generally more full than in either of the preceding states of the species.

Var. ϵ is like a combination of vars. α and δ; the lobes of the frond being obovate as in the latter, but fringed with dichotomous lobes as in the former. Its claim to rank as a distinct variety rests on the narrowness and minute division of these marginal lobes. I regret that there was not room to introduce a figure of this variety into our plate.

Fig. 1. NITOPHYLLUM PUNCTATUM :—β. ocellatum. 2. γ. crispatum. 3. δ. Pollexfenii :—*all the natural size.*

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W.H.H. del et lith.

Vincent Brooks Imp

PLATE CLXIX.

NITOPHYLLUM HILLIÆ, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red, (rarely purplish) irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores* grouped into definite *sori*, or spots, variously scattered over the frond. NITOPHYLLUM (*Grev.*),—corruptly formed from *nitor*, to *shine*, and φυλλον, a *leaf*.

NITOPHYLLUM *Hilliæ*; frond thickish, but tender, veiny towards the base, of a roundish outline, very irregularly and more or less deeply cleft; the segments oblong, slightly waved, obtuse; spots of granules dot-like, very minute, densely scattered over the surface of the frond.

NITOPHYLLUM Hilliæ, *Grev. Alg. Brit.* p. 80.

NITOPHYLLUM ulvoideum, *Hook. Br. Fl.* vol. ii. p. 287. *Wyatt, Alg. Danm.* no. 16. *Harv. Man.* p. 57.

AGLAIOPHYLLUM Hilliæ, *Endl. 3rd Suppl.* p. 52.

DELESSERIA Hilliæ, *Grev. Crypt. Fl.* t. 351.

HAB. On the shady sides of deep, tidal pools, near low-water mark. Rare. Annual. Summer and autumn. Plymouth, *Miss Hill;* also *Messrs. Rohloff, Hore, and Cocks.* Torquay, *Mrs. Griffiths.* Whitsand Bay, *Dr. Jacobs.* Scilly Islands, *Miss White.* Mountsbay, *Mr. Ralfs.* Jersey, *Miss Turner.* Valentia, Ireland, *W. H. H.*

GEOGR. DISTR. Coast of France, rare.

DESCR. *Root* a small, conical callus. *Stem* from a line to nearly half an inch in length, cylindrical at base, compressed upwards, and rapidly expanding into a roundish or somewhat flabellate frond, from four to twelve or sixteen inches in length. Frond very irregularly divided; sometimes nearly simple, with a few shallow marginal lobes, or broad crenatures; sometimes deeply cleft, nearly to the base, into a few broad segments, lobed at the margin; and sometimes deeply cut into ribbon-like laciniæ, proliferous from the margin, and considerably waved and crisped. Through the lower part of the frond run numerous, branching, flexuous veins, which are more or less apparent in different specimens, sometimes being very faint, sometimes strongly marked; and rarely, if ever, wholly absent. *Tubercles* as large as turnip-seed, scattered, hemispherical, containing a tuft of moniliform filaments, fixed to a central placenta, and forming *spores* from their terminal articulations. *Tetraspores* grouped in minute, roundish or oblong, dot-like sori profusely scattered over the greater part of the frond. *Substance* rather thick, tender, semi-transparent, adhering to paper in drying, in which state the surface retains some gloss. *Colour*, when growing, a fine, deep-crimson; becoming rosy in old age; changing to orange in fresh water, and, when dry, acquiring a brownish tint.

I have thought it right to restore the specific name under which this fine species has been described by Dr. Greville, in preference to that of *ulvoideum*, which I adopted in the Manual, in deference to the authority of Sir W. Hooker, who, in the British Flora, regards *Nitophyllum Hilliæ* as identical with *Fucus ulvoides* of Turner. By a reference to the Historia Fucorum it will be seen that *Fucus ulvoides* was founded on specimens communicated by Miss Hutchins, whose locality is alone mentioned for the species; although in the remarks appended to the description, Mr. Turner speaks of other specimens, received from Miss Hill, which he was disposed to consider the same, and which were, no doubt, our *Hilliæ*. These are the specimens which Sir W. Hooker mentions in the British Flora, as existing in his Herbarium. But these specimens, on which Mr. Turner's mind was not fully decided, (otherwise he would have quoted Miss Hill's habitat in its proper place,) cannot be regarded as the *ulvoides* of that author, unless they can be shown to be identical with those collected by Miss Hutchin's, from which the figure and description were taken. In the absence of direct evidence, which an inspection of Mr. Turner's Herbarium could alone supply, I am forced to judge of Miss Hutchins's *ulvoides* by the figure and description; and these, I have no hesitation in saying, agree in all respects with *tubercle-fruited* individuals of *N. punctatum*, and are not characteristic of our *N. Hilliæ*. I think it is, therefore, clear that the *Fucus ulvoides* of Turner must be considered a synonym of *N. punctatum*; and if this be admitted, all will agree, and none more readily than Sir W. Hooker, that in dedicating the present species to the memory of Miss Hill, its discoverer, and one of the most acute and successful marine botanists of her day, Dr. Greville has but paid a well-earned tribute to departed worth.

Fig. 1. A frond of NITOPHYLLUM HILLIÆ, producing *tetraspores*. 2. Portion of a frond with *tubercles*:—*both of the natural size*. 3. Portion of the surface, with a *sorus*. 4. Tetraspores. 5. Portion of the surface with a tubercle. 6. Vertical section of the same:—*all more or less highly magnified*.

Plate XXIII.

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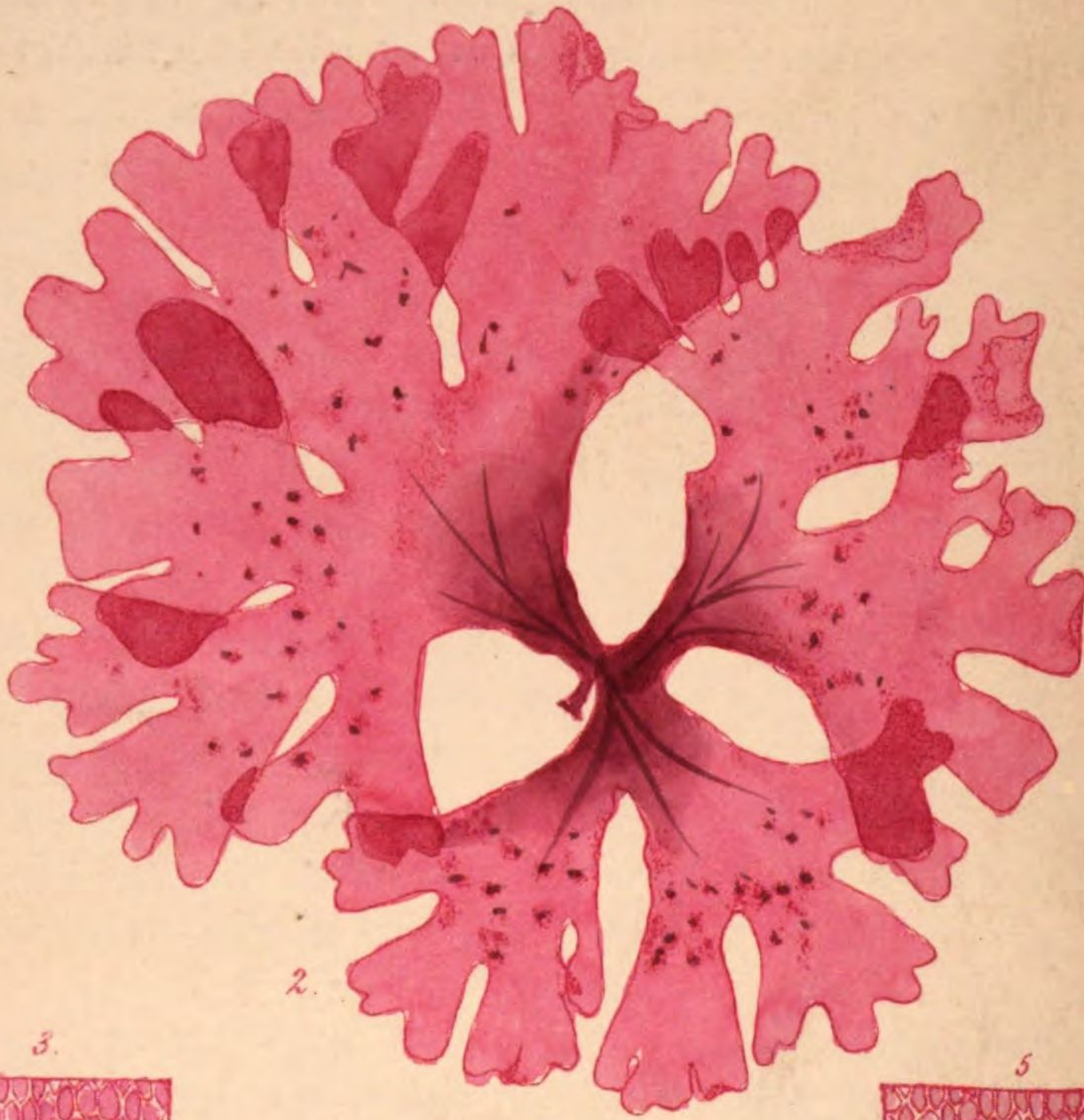
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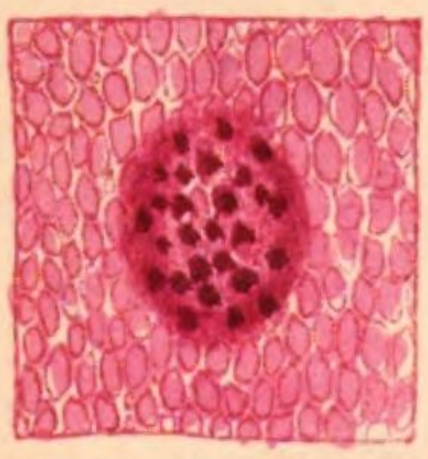
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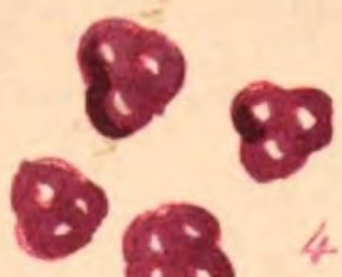
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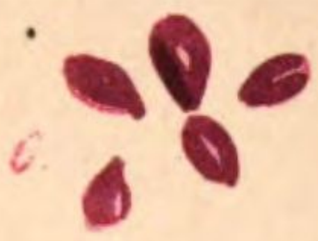
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PLATE XXIII.

NITOPHYLLUM BONNEMAISONI, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red, (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins toward the base. *Fructification*, two-fold, on distinct plants: 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM—corruptly formed from *nitor*, to *shine*, and φύλλον, a *leaf*; *shining-leaf*.

NITOPHYLLUM *Bonnemaisoni*; frond shortly stalked, fan-shaped or palmate, variously cleft into numerous wedge-shaped segments, furnished near the base with irregular, vanishing nerves; spots of granules roundish, scattered over the surface of the frond.

NITOPHYLLUM Bonnemaisoni, *Grev. Alg. Brit.* p. 81. *Hook. Br. Fl.* vol. ii. p. 287. *Harv. in Mack. Fl. Hib.* part 3. p. 193. *Harv. Man.* p. 58.

DELESSERIA Bonnemaisoni, *Ag. Sp. Alg.* vol. i. p. 186. *Ag. Syst.* p. 252. *Grev. Sc. Crypt. Fl.* t. 322.

AGLAIOPHYLLUM Bonnemaisoni, *Endl. 3rd. Suppl.* p. 52.

HAB. Growing on the stems of *Laminaria digitata*; and on rocks and stones in 4—5 fathom water. Annual. Summer. Orkney, *Rev. C. Clouston*. Bute, *Dr. Greville*. Larne, *Dr. Drummond*. Youghal, *Miss Ball*. Torquay and Ilfracombe, *Mrs. Griffiths*. Tramore, *Miss Taylor*. Miltown Malbay and Kilkee, *W.H.H.* Strangford Lough, *W. Thompson, Esq.* Jersey, *Miss White*.

GEOGR. DIST. Coast of Normandy, *Bonnemaison*. British Islands.

DESC. *Root* a small disc. *Stem* a quarter of an inch long, cylindrical, expanding into a fan-shaped, delicately membranaceous frond, 2–4 inches in length, and rather broader than its length, rarely quite veinless; usually marked toward the base with more or less evident, vanishing nerves, which sometimes extend considerably up the segments, and sometimes are nearly confined to the very base. The habit of the frond varies much in different individuals, in some the lamina is very broad and not deeply cloven; in others cleft nearly to the base in long ribbon-like segments. The division is pretty regularly dichotomous, but the margin in some specimens is proliferous, giving the frond a very compound aspect. *Colour* a fine rosy red, becoming brownish, especially toward the base, in drying. *Reticulations* (fig. 3, 5.) smaller than in *N. versicolor*. *Tubercles* small, not very prominent, scattered over the frond. *Spots* of *tetraspores* oblong or roundish, minute, but larger than those of *N. Hilliæ*, very abundantly scattered over the surface. It more or less perfectly adheres to paper in drying.

The fan-like outline, scattered groups of tetraspores, and obscure

basal veins distinguish the present species from other British *Nitophylla*. The nearest in affinity is certainly *N. versicolor*, already figured in this work, from which the basal veins, and the proportionably smaller size of the cellules composing the membrane, together with some small differences, more easily seen than described, distinguish it. From *N. Gmelini*, which it resembles in form, it is at once distinguished by the very different disposition of the tetraspores; from *N. Hilliæ*, by the thinner substance, smaller size, and less minute spots of tetraspores; and from *N. punctatum*, by the different outline of the frond.

The specimens here represented, which are of the average size of those that occur on the west of Ireland, where this species is constantly found growing on the stems of *Laminaria digitata*, are less luxuriant than those figured by Dr Greville. They are quite as large, however, as any Devonshire specimens I have seen. No doubt, at Larne, where all the *Nitophylla* luxuriate, so that the shore is pink with them, the present species reaches a much larger size.

Fig. 1. NITOPHYLLUM BONNEMAISONI:—with *tetraspores*. 2. A specimen producing tubercles;—*natural size*. 3. Portion of the frond, with a sorus. 4. tetraspores from the same. 5. Portion of the frond, with a tubercle. 6. Spores:—*all more or less highly magnified*.

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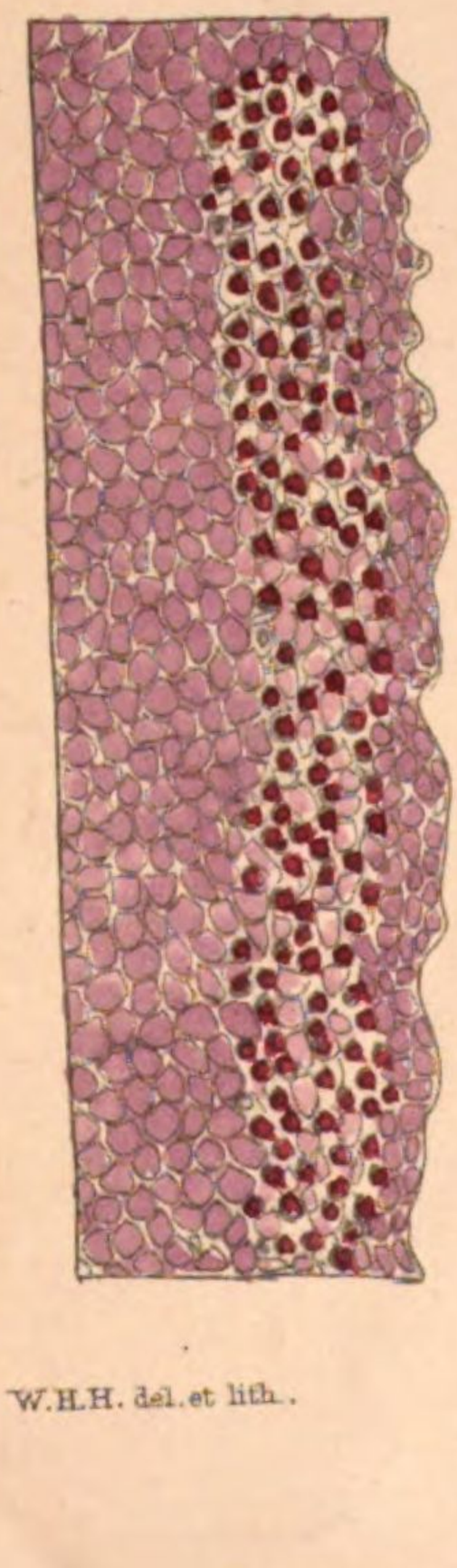

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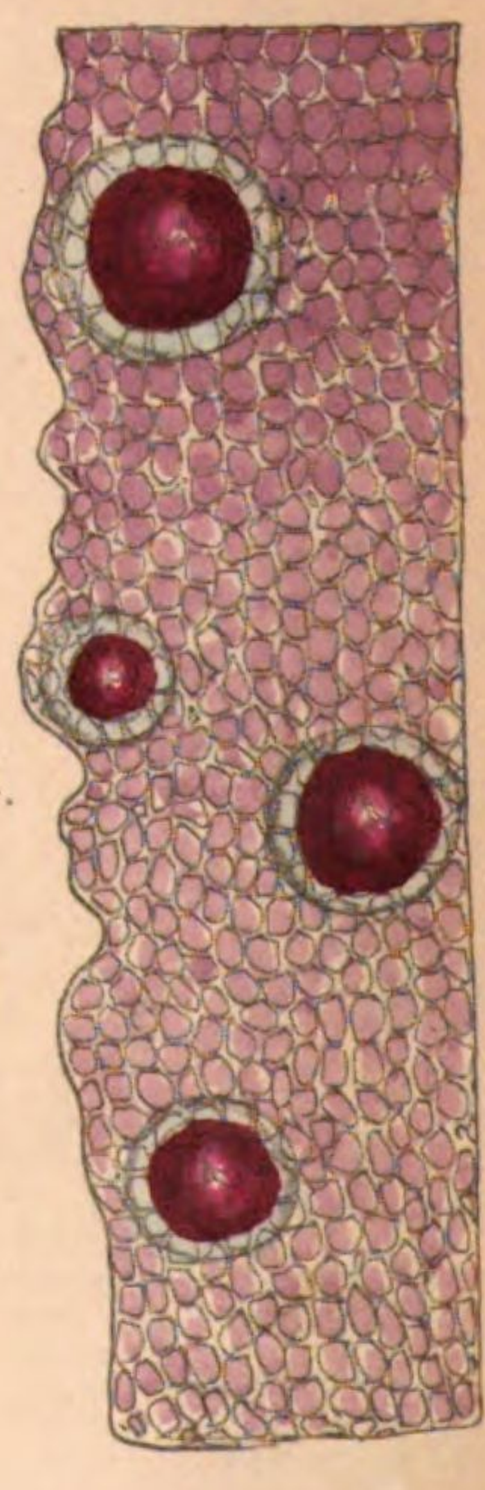

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W.H.H. del. et lith.

B.B.& R. imp.

PLATE CCXXXV.

NITOPHYLLUM GMELINI, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores*, grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM (*Grev.*),—corruptly formed from *nitor*, to *shine*, and φυλλον, a *leaf*.

NITOPHYLLUM *Gmelini*; frond short-stalked, fan-shaped, with a roundish outline, variously cleft into broadly wedge-shaped segments, waved, curled, rather rigid, marked near the base (and sometimes over the surface) with vague, vanishing nerves; spots of tetraspores linear, confined to the margin.

NITOPHYLLUM Gmelini, *Grev. Alg. Brit.* p. 82. *Hook. Fl. Brit.* vol. ii. p. 288. *E. Bot. Suppl.* t. 2779. *Wyatt, Alg. Danm.* no. 65. *Harv. in Mack. Fl. Hib.* part 3. p. 193. *Harv. Man.* p. 58.

AGLAIOPHYLLUM Gmelini, *Mont. Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 443. *Endl. 3rd Suppl.* p. 52.

DELESSERIA Gmelini, *Lamour. Ess.* p. 36.

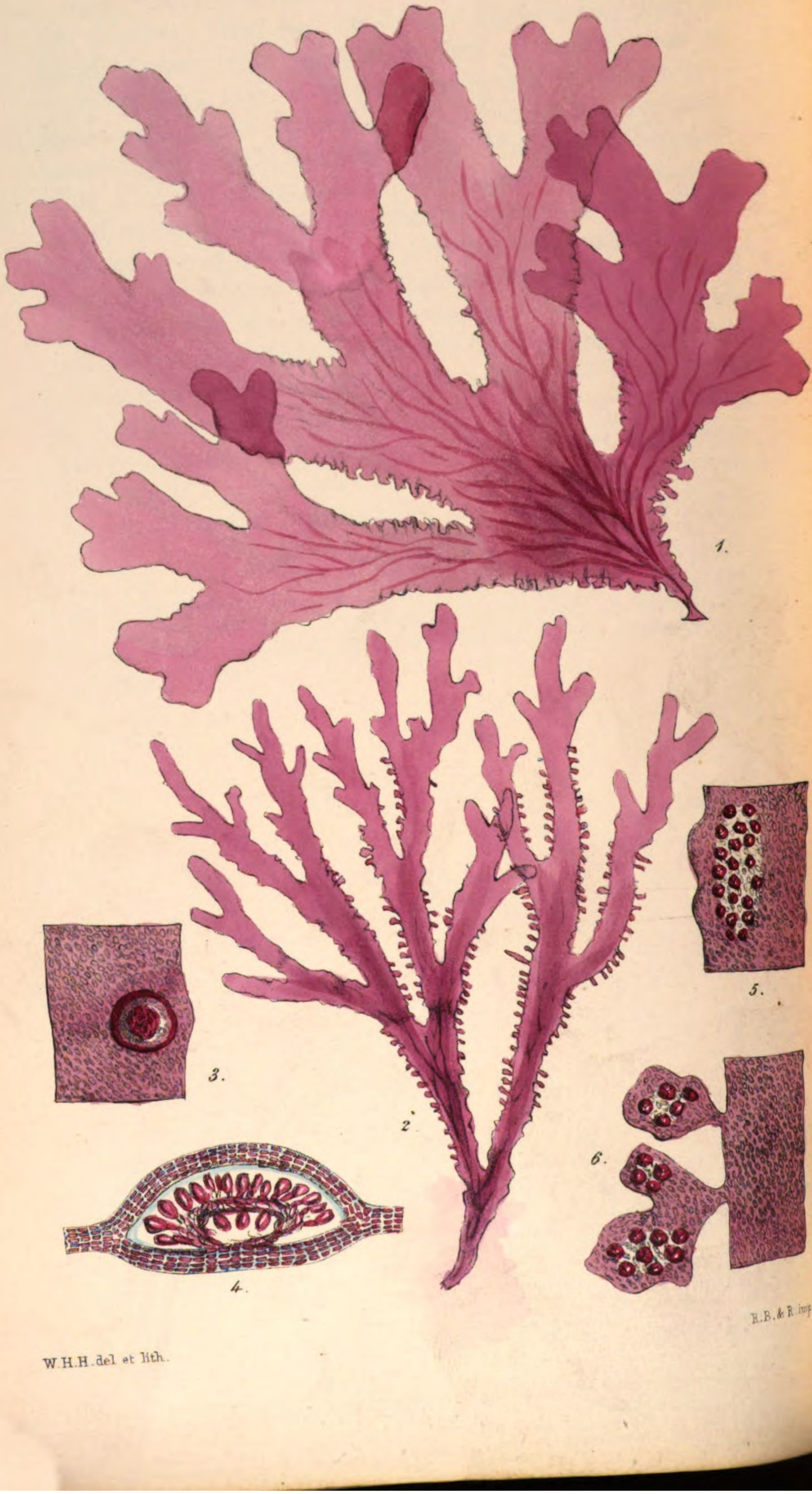
HAB. On rocks, and the larger Algæ, near low-water mark, and at a greater depth. Annual. Summer. South of England; particularly large and abundant near Plymouth. North and west of Ireland. Howth, *Miss Gower*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic coasts of France and Spain.

DESCR. *Root* a small, conical disc. *Stem* from a quarter to half an inch in length, cylindrical and cartilaginous below, soon becoming compressed, and then expanding into the wedge-shaped base of the frond. *Frond* two to six inches in length, and as much or more in breadth, flabelliform, with a roundish outline, either nearly entire, with the margin cut into shallow lobes, or deeply cleft into numerous broad segments, which are either jagged or subdivided in a dichotomous manner; and sometimes cut into narrow ribbons. *Segments* cuneate at base, widening upwards, their apices rounded, or angularly cut. The *margin* is generally much undulated. From the base of the frond there issue numerous branching veins, which ramify over the surface, and gradually become fainter upwards; these in some specimens are faint, and soon lost, and in others are strongly marked and evident, even in the upper segments. *Tubercles* either confined to the margin, or scattered over the disc of the upper lobes, hemispherical, depressed, containing a large tuft of dark-red spores. *Tetraspores* disposed in linear *sori*, always placed just within the margin of the frond, and following its curvature. *Colour* a full deep-lake, becoming a bright pink in drying. *Substance* crisp, and somewhat rigid, crackling in the fingers; becoming flaccid in fresh-water. *Cells* of the surface large, irregularly hexagonal.

From all the British species of *Nitophyllum*, except *N. laceratum*, this handsome plant may be at once distinguished, when in tetrasporic-fruit, by the marginal position of the sori; from *N. laceratum* it can only be known by difference in form, in substance, and, in some measure, by its brighter colour. The usual narrow varieties of *N. laceratum* are so different from any state of *N. Gmelini*, that we should hardly anticipate the occurrence of individuals of doubtful characters, which seem to stand almost equidistant from either species. And yet some luxuriant specimens of *N. laceratum* so nearly approach the cloven varieties of *N. Gmelini*, that in a dried state especially, they are apt to deceive even a practised eye. When the plants are freshly gathered indeed, they are most easily separated,—*N. Gmelini* being known by a peculiarly crisp, rigid feel, and *N. laceratum* by softness, and at the same time toughness. The colour of the latter is more purple, and often reflects prismatic colours; and the nerves are much more clearly defined than in *N. Gmelini*.

Fig. 1. NITOPHYLLUM GMELINI:—*of the natural size*. 2. Portion of the frond, with a marginal *sorus*. 3. *Tetraspores*, from the same. 4. Portion of the frond with tubercles. 5. Section of one of the tubercles:—*all more or less highly magnified*.



W.H.H. del et lith.

R.B. & R. imp.

PLATE CCLXVII.

NITOPHYLLUM LACERATUM, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores* grouped into definite *sori*, or spots variously scattered over the frond. NITOPHYLLUM (*Grev.*), corruptly formed from *nitor*, *brilliancy*, and φύλλον, a *leaf*.

NITOPHYLLUM *laceratum*; frond sessile or shortly stipitate, much branched dichotomously, traversed by numerous branching and anastomosing nerves; segments linear, variously cleft and lobed, waved at the margin, obtuse; spots of tetraspores oblong, either marginal or borne on distinct, leafy processes of the margin.

NITOPHYLLUM laceratum, *Grev. Alg. Brit.* p. 83. *Hook. Brit. Fl.* vol. ii. p. 288. *Wyatt, Alg. Danm.* No. 107. *Harv. in Mack. Fl. Hib.* part 3. *Harv. Man. Ed.* 1. p. 59.

CRYPTOPLEURA lacerata, *Kütz. Phyc. Gen.* t. 68. vol. iii. p. 444. *Sp. Alg.* p. 870.

AGLAIOPHYLLUM laceratum, *Mont. Fl. Canar.* p. 150. *Endl. 3rd Suppl.* p. 52.

DELESSERIA lacerata, *Ag. Sp. Alg.* vol. i. p. 184. *Ag. Syst.* p. 251. *Grev. Fl. Edin.* p. 293.

WORMSKIOLDIA lacera, *Spreng. Syst. Veg.* vol. iv. p. 332.

CHONDRUS laceratus, *Lyngb. Hyd. Dan.* p. 18.

FUCUS laceratus, *Gmel. Hist.* p. 179. t. 21. f. 4. *Good and Woodw. Linn. Trans.* vol. iii. p. 155. *Stack. Ner. Brit.* p. 77. t. 13. *Turn. Syn.* p. 154. *Turn. Hist.* t. 68. *E. Bot.* t. 1067.

FUCUS crispatus, *Huds. Fl. Alg.* p. 58. *Linn. Syst. Nat.* p. 1718. *Esper, Ic. Fuc.* vol. i. p. 130. t. 90.

FUCUS endiviæfolius, *Lightf. Fl. Scot.* p. 948. t. 32.

HAB. On rocks and on the stems of *Laminaria digitata*, near low-water mark and at a greater depth. Annual. Summer. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic Coasts of Europe and North America.

DESCR. *Root* a small disc, often throwing out creeping fibres. *Fronds* sessile, or with a very short, cartilaginous stem, much divided, four to six or eight inches in length, and as much in expansion, the laciniæ varying in breadth from a quarter of an inch to upwards of an inch. The division of the frond is usually dichotomous, with many irregularities; the laciniæ are linear, or somewhat cuneiform, lobed and dentate, and often curled at the margin, very obtuse, simple or repeatedly forked. The lower part of the membrane is always traversed by slender, branching and anastomosing, tolerably distinct veins, which in some specimens extend and ramify through the upper

part of the frond also: these are rarely indistinct, and are often very well defined. The axils are patent, the apices spreading widely. A variety is common in which the lateral smaller lobes of the frond hook backwards and coil round any neighbouring plant. *Coccidia* depressed, spheroidal, generally marginal or in marginal processes, containing, on a central placenta, numerous chained spores. *Spots* of tetraspores minute, oblong, confined to a line immediately within the margin, or else placed in little leafy processes which fringe the principal laciniæ of the frond. *Substance* delicately membranaceous, and very thin, but somewhat tough, elastic, and not adhering strongly to paper. *Colour* a purplish or brownish full red, reflecting glaucous tints when growing.

This is the most generally dispersed species of *Nitophyllum*, and the one most usually met with within tide marks. It frequently is found fringing the steep and shaded sides of deep rocky pools, when protected from the sun by overhanging *Fuci*; but its favourite place of growth seems to be on the stems of the larger oar-weeds. The frond varies much in breadth in different specimens, as may be seen by our figure, which, however, by no means represents the extreme forms. Some specimens are so broad and so little divided that they closely approach *N. Gmelini* in aspect, especially when dried; but the substance and colour of the two plants are essentially different, and when seen growing it is impossible to mistake one for the other. A very singular variety of *N. laceratum* is frequently seen between tidemarks, attaching itself by hooked lobes to neighbouring small algæ, and sometimes so intricately interwoven with their stems that it cannot be extricated without tearing. In this the frond is very narrow, of a brighter colour than usual, and almost every lobe converted into a strong recurved hook.

I have frequently observed spores to be developed within the substance of the placenta, as well as on its outer surface. Our figure (fig. 4) represents them in both positions, as seen in a vertical section of the conceptacle.

Fig. 1. NITOPHYLLUM LACERATUM; a broad variety. 2. A narrow variety, with marginal processes:—*both of the natural size.* 3. Small portion of the membrane with a marginal coccidium. 4. Section of the coccidium. 5. Marginal spot of tetraspores. 6. Marginal processes containing spots of tetraspores:—*all magnified.*

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PLATE IX.

NITOPHYLLUM VERSICOLOR, *Harv.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins toward the base. *Fructification*, two-fold, on distinct plants: 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular seeds; 2, *tetraspores* grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM—corruptly formed from *niteo*, to *shine*, and φύλλον, a *leaf*; *shining-leaf*.

NITOPHYLLUM *versicolor*; stem cartilaginous, elongated, simple or branched, suddenly expanding into a broadly fan-shaped, variously cleft frond, of a thickish-membranaceous, highly reticulate substance and rose-red colour, becoming golden-orange in fresh water; the segments rounded; the apices generally thickened, and ciliiferous; fructification unknown.

NITOPHYLLUM versicolor, *Harv. Manual*, p. 59.

HAB. Very rare. Thrown up, probably from deep water. Annual. June to August. Ilfracombe, *Miss Hill* (1800) and *Mrs. Griffiths*. Youghal, *Miss Ball* (1834).

GEOGR. DISTR. Southern shores of England and Ireland.

DESC. *Root* unknown. *Stems* irregularly tuberous or incrassated below, from half an inch to an inch long, fleshy, firm, cylindrical or club-shaped, 1–2 lines thick, simple or branched. The *branches* suddenly expand into broadly fan-shaped fronds 2–3 inches in breadth, and 1½–2 inches in height, more or less deeply cleft in a dichotomous manner, membranaceous and veinless. Segments in some specimens less than half an inch broad, in others above an inch, cuneate, now once or twice cleft, now many times divided, roundish at the apices, entire or minutely ciliate. The tips of the frond, and sometimes portions of the lateral margin, are much thickened, producing oblong or oval fleshy excrescences something similar in appearance to the thickened base of the stem. These *calli* are in an early stage minutely papillate, especially towards the outer edge (fig. 6), but as they advance in age the papillæ elongate into irregularly branched, cellular, cylindrical filaments (fig. 5, 9, 10). On cutting open the *callus* innumerable minute granules, resembling those which constitute the solid part of the endochrome of the cells, issue forth, but these bear no resemblance to spores of any description. The substance of the frond is thicker, and the reticulations, shown at fig. 4, larger than in *N. Bonnemaisoni*, to which species the present is nearly allied. The colour when fresh is a rosy-red, but the slightest contact with fresh water changes this to a golden-orange. On drying, however, the original colour is restored, and is retained in the herbarium. The substance is softer than in *N. Gmelini*, and in drying the plant adheres more firmly to paper.

I have little to add to the account of this species already pub-

lished in the Manual, except it be to record the discovery, by Miss Ball in the south of Ireland, of remarkably luxuriant specimens, from one of which the uppermost figure in our plate has been drawn. Miss Ball's first specimens were gathered in 1834, and she obtained further supplies in 1840 and 1844:— but as all these, like the Devonshire plants, were washed on shore, the *habitat* of the species remains unknown.

By a recent communication from Mrs. Griffiths I learn that it was Miss Hill, and not Mrs. Hare, who was the original discoverer of this species in 1800; but it appears to have been known to the latter lady shortly afterwards, and called by her *Fucus Halensis*. To Mrs. Griffiths it has been familiar for thirty years under the colloquial name "*Orange Dwarf*," which at once expresses its usually small size, as compared with others of the genus, and the rapid change of colour which it undergoes on touching fresh water. The last peculiarity is so striking that a passing shower of rain has often betrayed it to Mrs. Griffiths, when before the shower it had passed unnoticed among other red plants.

Dr. Greville in his '*Cryptogamic Flora*' considers it identical with *N. Bonnemaisoni*, an opinion which he subsequently abandoned; and in his *Algæ Britannicæ* he refers it to *N. Gmelini*. I agree with Mrs. Griffiths in judging it to be distinct from both these species, at the same time admitting that it borders very closely on both, and that in the absence of a knowledge of its fructification it is difficult to fix on a very tangible distinguishing character. I have endeavoured, in the accompanying plate, to detail all its known characters. Among these it is impossible to overlook the anomalous, but very constant, production of *calli*, giving birth to branching filaments, totally unlike the usual form of proliferous growth; as certainly not parasitical; neither, so far as we know, having relation to fructification. And yet it must be confessed that they bear a near resemblance to the fructiferous processes of the singular Australian genus *Heterocladia* of Decaisne. It would be a highly curious and interesting discovery should *tetraspores* ever be found on these processes in the present species.

Fig. 1, 2, 3. NITOPHYLLUM VERSICOLOR, different varieties:—*natural size*. 4. Portion of the frond, to show the structure. 5, 6. Apices, producing calli. 7. Section of a callus. 8. Granules filling its cavity. 9, 10. Ciliæ of the callus:—*all more or less magnified*.

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PLATE XLIV.

PLOCAMIUM COCCINEUM, *Lyngb.*

GEN. CHAR. *Root* fibrous. *Frond* pinky-red, linear, compressed or flat, ribless, or faintly nerved, cellular, distichously much branched; the ramuli alternate, or secund, acute. *Fructification* of two kinds on distinct individuals; 1, spherical *tubercles* (*coccidia*) sessile or stalked, marginal or axillary, containing a globular mass of angular spores; 2, lateral or axillary, simple or branched *pods* (*stichidia*) containing a double or single row of transversely parted, oblong *tetraspores*. PLOCAMIUM (*Lamour.* ref.),—from πλόκᾶμος, *braided hair*.

PLOCAMIUM *coccineum*; frond narrow, cartilaginous, plano-compressed; branches irregularly alternate, patent; ramuli subulate, secund, three or four consecutively, pectinate on their inner edges; tubercles lateral, sessile; stichidia scattered, lanceolate, simple or branched.

PLOCAMIUM coccineum, *Lyngb. Hyd. Dan.* p. 39. t. 9. *Grev. Alg. Brit.* p. 98. t. xii. *Hook. Br. Fl.* vol. ii. p. 293. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Wyatt, Alg. Danm.* no. 20. *Harv. Man.* p. 65. *Ag. Alg. Medit.* p. 155. *Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 449. t. 64. *Mont. Pl. Cel. Canar.* p. 152. *Hook. fil. Fl. Antarct.* vol. i. p. 186.

PLOCAMIUM vulgare, *Lamour. Ess.* p. 50. *Gail. Dict. Sc. Nat.* vol. liii. p. 368.

PLOCAMIUM Lyngbyanum, *Kütz. l. c.* p. 450.

PLOCAMIUM Binderianum, *Kütz. l. c.* p. 450.

DELESSERIA coccinea, *Ag. Syn.* p. xiv. *Hook. Fl. Scot.* part 2. p. 101. *Grev. Fl. Edin.* p. 294.

DELESSERIA Plocamium, *Ag. Sp. Alg.* vol. i. p. 180. *Syst.* p. 250. *Mart. Fl. Brazil.* p. 42.

CERAMIUM Plocamium, *Roth. Fl. Germ.* vol. iii. p. 458. *Cat. Bot.* vol. ii. p. 161, and vol. iii. p. 107.

FUCUS coccineus, *Huds. Fl. Ang.* p. 586. *Linn. Trans.* vol. iii. p. 187. *Stack. Ner. Brit.* p. 106. *Turn. Syn.* vol. ii. p. 291. *Hist.* t. 59. *E. Bot.* t. 1242.

FUCUS Plocamium, *Gm. Hist.* p. 153. t. 16. f. 1. *Lightf. Fl. Scot.* vol. ii. p. 957. *Esper. Ic.* vol. i. p. 18. t. 2.

β, *uncinata*; small, slender, very flexuous, entangled and irregularly branched; ramuli patent or frequently hooked back.

PLOCAMIUM fenestratum, *Kütz. Phyc. Gen.* p. 450.

HAB. On submarine rocks and the larger Algæ, generally growing beyond the usual tide-level. Perennial. Summer and Autumn. Common on the British shores.

GEOGR DISTR. Abundant in the northern and southern temperate zones. Brazil, *Martius*. Cape Horn, *Dr. Hooker*. Auckland Island; New Zealand; Tasmania. Cape of Good Hope.

DESCR. *Root* consisting of branching fibres, matted together. *Fronds* tufted 2–12 inches long, exceedingly branched, and bushy, compressed or nearly flat, two-edged, narrow, linear, irregularly divided; main stems from half a line to nearly a line in breadth, alternating or subdichotomously branched; branches distichous, frequent, often secund, patent, bearing one or more sets of similar lesser branches. *Ramuli* subulate, acute, patent, fringing the edges of the branches, secund, three or four at one side, and then three or four at the other; the lowest in position of each set simple, rarely crenulate along its outer edge, the rest pectinate along their inner edge with subulate teeth, which, in luxuriant specimens, bear a second or third series. *Tubercles* solitary, sessile on the edges of the stem and branches. *Stichidia* lanceolate or dichotomous, scattered along the edges of the upper branches, occasionally tufted, containing several oblong *tetraspores*, each marked by three pellucid transverse lines or zones, and finally separating into four granules. *Colour* a fine transparent red, between crimson and scarlet. *Substance* cartilagineo-membranaceous, adhering, but not very closely, to paper.

A well-known, abundant, and beautiful species, and an especial favourite with amateur weed-collectors, and manufacturers of sea-weed pictures. It is also a very widely dispersed plant, being found in greater or less abundance and luxuriance, but with the same essential characters, in all waters from the North Cape to Cape Horn, in which last mentioned locality Dr. Hooker gathered specimens, in every respect identical with our most strongly growing British individuals.

With the exception of this *pelagic* species, the genus *Plocamium*, in which I include the *Thamnophora* of Agardh, and the *Thamnocarpus* of Kützing (not of *Harv.* in *Hook.* Ic. Plant.) is confined to the Southern Ocean, where many very distinct species are found, some of which are of large size, having brilliant crimson or rose-red fronds from a quarter to half an inch in breadth, and elegantly pectinato-pinnate. To all, the alternate, or secund, acute ramuli are common; the only variation being that in some they are deltoid, in others subulate, and in some secund *in pairs*, in others (as in our *P. coccineum*) secund *in fours*. In one remarkable one, *P. Hookeri*, Harv., a native of Kerguelen's Land, the branches bear, in addition to the subulate ramuli, occasional expanded, leaf-like processes.

Fig. 1. PLOCAMIUM COCCINEUM:—*natural size.* 2. Portion of a branch. 3. Branchlet with a *tubercle*. 4. Tubercle. 5. Spores from the same. 6. Branchlet with *stichidia*. 7. A *stichidium*. 8. Tetraspores, transversely parted.

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W. H. H del et lith.

Reeve, Benham & Reeve imp.

PLATE CLVII.

STENOGRAMME INTERRUPTA, *Mont.*

GEN. CHAR. *Frond* rose-red, leaf-like, nerveless, laciniate; composed, *internally*, of large, transparent, stratified cells; *externally* of minute, coloured cellules. *Fructification*; 1, linear, convex, longitudinal, (nerve-like) *conceptacles*, containing a dense mass of minute *spores*; 2, *tetraspores* (unknown)? STENOGRAMME (*Harv.*),—from στενος, *narrow*, and γραμμη, a *line*; alluding to the linear fructification.

STENOGRAMME *interrupta*; frond stipitate, membranaceous, flabelliform, more or less deeply laciniate; laciniæ repeatedly dichotomous, their apices obtuse; conceptacles forming a nerve-like line through the centre of each lacinia, and (usually) abruptly terminating opposite the furcation.

STENOGRAMME interrupta, *Mont. in Duchart. Rev. Bot.* 1846. p. 483.

STENOGRAMME europea, *Harv. in Herb.* 1847.

DELESSERIA interrupta, *Ag. Sp. Alg.* vol. i. p. 179. *Ag. Syst.* p. 250. *Mont. in Webb, Ot. Hisp.* p. 15. t. 8. *Endl. 3rd Suppl.* p. 53.

HAB. Among rejectamenta, probably washed up from deep water. Annual? November. Very rare. Bovisand, near Plymouth, *Dr. John Cocks*. Mount Edgecombe, *Rev. W. S. Hore*.

GEOGR. DISTR. Cadiz, *Cabrera*. Plymouth Harbour.

DESCR. *Root*, a small conical disk. *Frond* furnished with a short stem, 3–4 lines long, which soon becomes compressed, and rapidly expands into a fan-shaped membrane, from three to five inches, or perhaps more, in length, and fully as much in breadth. In some specimens the membranous expansion is divided, nearly to its base, into numerous, linear, ribbon-like laciniæ, which are more or less regularly dichotomous, with narrow axils, and rounded tops; in others the laciniated portion extends only a half, or two-thirds the length of the frond, the remainder being undivided; and in others again, the truncated tips of the frond, which have been injured from some cause, throw out proliferous, cuneate, forked leaflets. In all varieties, something of a fastigiate outline is preserved. The margin, which is usually quite flat and very entire, sometimes throws out minute, lobed, and somewhat curled fringing processes. Barren fronds are quite destitute of nerve; *fertile* ones (which are more common) have the centre of each lacinia traversed by a raised, nerve-like line, which commences just below one of the forkings, and terminates nearly opposite to a lower fork: this is the commencement of fructification. It rarely, if ever, happens that the whole of this line proves fertile; usually, small portions varying from one to four lines in length become much thickened, considerably raised, and of a dark-red colour; and these, at maturity, are filled with innumerable, minute spores; sometimes but a very minute portion of the line is transformed, and a *spherical conceptacle* results (fig. 6.). *Substance* cartilagineo-membranous, becoming flaccid, and adhering to paper in drying. *Colour* a fine clear, pinky red, becoming orange in fresh water; darker towards the base, and becoming duller in drying, but preserving a polished surface. The cells of the central portion of the frond are large, and apparently

empty, in two or three rows; those of the outer stratum minute, irregularly placed, and full of coloured matter.

This very interesting plant, by far the most important addition which has been made to the British Marine Flora since the commencement of the present work, was discovered on the 21st October, 1847, by Dr. John Cocks of Plymouth, among rejectamenta on the shore at Bovisand. A few days subsequently it was met with in a neighbouring station by the Rev. W. S. Hore, who at the same time gathered the equally rare and curious *Carpomitra Cabreræ*; and to the untiring perseverance of both these gentlemen, who, day by day, during the inclement month of November—in all weathers—visited the shore, and preserved every scrap of these plants which the waves threw up, we are indebted for all the British specimens which have yet been taken of the *Stenogramme*, and for all, except Miss Ball's original one, of the *Carpomitra*. To Dr. Cocks and Mr. Hore, I am anxious to express my obligations for numerous specimens of these rare plants; and to the latter especially, for much important information illustrating the history of the present. It is right to state that Mr. Hore's observation led to my correcting the error into which, following Agardh, I should have fallen, of describing the thickening of the frond, caused by incipient fructification, as a true nerve. Mr. Hore having found a barren specimen in which no such nerve exists, established the truth of his view, which he had previously entertained from other considerations.

The genus *Stenogramme* was originally proposed by me, in the 'Botany of Beechey's Voyage,' for a plant found on the coast of California which strongly resembles the present in habit, and quite agrees with it in structure and fructification. Strange to say, according to a specimen preserved in Bory St. Vincent's Herbarium, *S. Californica* appears to be a native of France also!

English specimens of *S. interrupta* are broader, less regularly, and less deeply divided than the figure of a Spanish specimen given by Montagne; but I am assured by my learned "Confrère en Flore," that he considers the plants to be identical.

Fig. 1. STENOGRAMME INTERRUPTA:—*of the natural size.* 2. Portion:—*slightly magnified.* 3. Vertical cross section of half the breadth of a fertile lacinia. 4. Spores. 5. Magnified view of the surface:—*all magnified.* 6 Portion of a frond with fimbriated margin and *spherical* conceptacle:—*of the natural size.* 7. Section of the same:—*magnified.*

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PLATE XXXII.

RHODYMENIA BIFIDA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous, or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick, cellular pericarp, and containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA * (*Grev.*)—from ῥοδεος, *red*, and ὑμὴν, a *membrane*.

RHODYMENIA *bifida*; frond thin and transparent, rose-red, dichotomously divided from the base; segments linear, or cuneate; apices obtuse; tubercles mostly marginal, sessile; tetraspores transversely zoned.

RHODOMENIA bifida, *Grev. Alg. Brit.* p. 85. *Hook. Br. Fl.* vol. ii. p. 289. *Wyatt. Alg. Danm.* no. 66. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Harv. Man.* p. 60. *Endl. 3rd Suppl.* p. 51.

DELESSERIA bifida, *Lamour. Ess.* p. 37.

SPHÆROCOCCUS bifidus, *Ag. Sp. Alg.* vol. i. p. 299. *Syst.* p. 231. *Kütz. Phyc. Gen.* p. 410.

FUCUS bifidus, *Goodw. et Woodw. Lin. Trans.* vol. iii. p. 159. t. 17. f. 1. *Sm. E. Bot.* t. 773. *Turn. Syn.* p. 165: *Turn. Hist.* t. 154.

Var. β, *ciliata*; frond somewhat thicker than usual, opake, brownish red, narrow, much divided; the margins fringed with leafy cilia.

Fucus bifidus, β. ciliatus, *Turn. Syn.* p. 165. *Hist. l. c.*

Var. γ, *incrassata*; frond thicker than usual, shrinking and changing to brownish red in drying, broad; segments cuneate, proliferous or ciliate at the margin.

HAB. On rocks in the sea, beyond the influence of the tide, and on Algæ. Annual. Summer. Frequent on the southern shores of England; and along the west, and south, and eastern coasts of Ireland. Yarmouth, *Mr. Wigg*. Tynemouth, *Mr. Winch*. Belfast Bay, *Mr. Templeton*. Jersey, *Miss White*. Ardrossan, Saltcoats, and Kilbride, *Rev. D. Landsborough*. Var. γ, Belfast Bay, *Mr. W. Thompson*. Carrickfergus, *Mr. Mc' Calla*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean sea.

DESCR. *Root* discoid, accompanied by fibres. *Fronds* 1–2 or 4 inches high, growing in globose tufts, veinless, thin, delicately membranaceous, dichotomous with more or less regularity, usually much divided; segments

* Spelled *Rhodomenia* by Dr. Greville; altered to *Rhodymenia* by M. Montagne, as being more in conformity with the Greek.

linear, or slightly widened upwards; in common varieties (fig. 2) from two to four lines wide, sometimes much narrower or much wider; the axils rounded; the apices obtuse, commonly truncate or subemarginate, sometimes rounded, and occasionally slightly tapered. The margin is either entire and plane, or fringed with minute processes, which sometimes lengthen into proliferous foliations. *Tubercles* globose, generally abundant, and sessile along the margin of the segments; rarely scattered over the disc. *Tetraspores* forming cloud-like spots in the upper segments, oblong, divided by three transverse, zone-like lines. *Colour* in Var. *α*, a clear, transparent rose-red. Var. *β*. is very much narrower, and more intricately and irregularly divided, of a darker, often very dark colour, opake, and thick, and forms entangled tufts. Var. *γ*. is from half an inch to an inch in breadth, but little divided, cartilagineo-membranaceous, transparent, red when fresh, but becoming brownish, and not adhering to paper in drying; it produces marginal tubercles in abundance. Several other varieties are mentioned by Turner.

Our plate represents three forms of this most variable plant, between the broadest and narrowest of which, innumerable states occur; some of which, like our central figure, which may be regarded as the *normal* state, are of a delicate rosy colour, transparent and membranaceous; while others are more or less incrassated, and, especially when dry, of a brownish red. The specimen represented at fig. 1. was gathered by Mr. Moore on the coast of Antrim, and Miss Hyndman has found, at Bundoran, specimens of equal, or even greater luxuriance.

Rhodymenia bifida differs from others of the genus, not merely in being more membranaceous, but in its fructification. The tetraspores, represented at fig. 9, are in it divided by transverse zones, like those of *Plocamium*, of *Catenella*, and of some other Algæ; while in *Rhodymenia proper* they are of the more common tri-partite kind. This character, in the present genus-making age, is perhaps of sufficient importance to justify the removal of *R. bifida* to a new genus; but I am not prepared to say how many, or whether any, others of the *Rhodymeniæ* have similar tetraspores. Should future observations confirm my suggestions, the new genus may be called *Wigghia*, in memory of Mr. Lilly Wigg "the instructor" in marine botany of Dawson Turner, and whose name, however uncouth, ought to be gratefully remembered by British Algologists.

Fig. 1. RHODYMENIA BIFIDA; unusually broad state. 2. The same; normal variety. 3. Var. *β*:—*all of the natural size.* 4. Fragment of the frond, showing the surface cellules. 5. Segment with tubercles. 6. Vertical section of a tubercle. 7. Spores from the same. 8. Segment with tetraspores. 9. Tetraspores:—*all more or less magnified.*

W.H.H. del et lith.

Reeve imp

PLATE CXXI.

RHODYMENIA LACINIATA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous, or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*), having a thick, cellular pericarp, and containing a mass of minute spores, on a central placenta; 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA (*Grev.*),—from ῥοδος, *red*, and ὑμὴν, a *membrane*.

RHODYMENIA *laciniata*; frond thickish, sub-cartilaginous, opake, bright red, more or less palmate or flabelliform, cleft into numerous, broad, wedge-shaped segments, which are again divided in a subdichotomous manner; the apices obtuse; the margin, when in fructification curled and fringed with minute ciliæ, in which the tubercles are imbedded.

RHODYMENIA laciniata, *Grev. Alg. Brit.* p. 86. *Hook. Br. Fl.* vol. ii. p. 289. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Wyatt, Alg. Danm.* no. 17. *Harv. Man.* p. 60. *Endl. 3rd Suppl.* p. 51.

DELESSERIA laciniata, *Grev. Fl. Edin.* p. 293. *Hook. in Fl. Lond., New Series*, no. 198.

DELESSERIA ciliaris, *Lamour. Ess.* p. 37.

CALOPHYLLIS laciniata, *Kütz. Phyc. Gen.* p. 401.

HALYMENIA ciliaris, *Gaill. Dict. Sc. Nat.* v. 53. p. 360.

SPHÆROCOCCUS laciniatus, *Lyngb. Hyd. Dan.* p. 12. t. 4. *Ag. Sp. Alg.* vol. i. p. 297. *Ag. Syst.* p. 230. *Hook. Fl. Scot.* part 2. p. 103. *Spreng. Syst. Veg.* vol. iv. p. 334.

FUCUS laciniatus, *Huds. Fl. Ang.* p. 579. *Lightf. Fl. Scot.* p. 947. *Sm. E. Bot.* t. 1068. *Turn. Syn. Fuc.* p. 161. *Turn. Hist.* t. 69. *Esp. Ic. Fuc.* t. 140.

FUCUS crispatus, *Stack. Ner. Brit.* t. 15.

FUCUS miniatus, *Fl. Dan.* t. 769.

FUCUS crispus, *Esp. Ic. Fuc.* t. 18.

HAB. On rocks and stones in the sea, and on *Laminariæ*; rarely within tide mark. Biennial. January to July. Frequent on the British shores, from Orkney to Cornwall. Common in Ireland. Jersey.

GEOGR. DISTR. Atlantic shores of Europe from Norway to Spain. Abundant in the Fœroe Islands. Eastern coasts of North America, as far south as Delaware.

DESCR. *Root* minute, discoid. *Fronds* tufted, from three to ten inches long, with a short flattish stem, which soon expands into the cuneate base of the frond, cloven into numerous principal segments, all of which are narrow, and wedge-shaped below, gradually wider upwards, and are more or less parted into laciniæ, by vertical clefts. In some varieties the segments are three or four inches broad, and very little divided, except at the superior margin, which presents a rounded outline, and is parted into nume-

rous short pedate lobes, which overlap each other; in others the segments are split nearly to their base into linear-wedge-form ribbons, from a quarter to half an inch in length. The uninjured apices are always obtuse. In fertile specimens the lateral margins of the lobes, especially towards the base, are minutely curled and closely fringed with minute, leafy, subsimple, or multifid processes, in which the tubercles are formed. *Tubercles* variable in size, globose, always formed in the marginal ciliæ, containing several detached groups of spores; spores hyaline, each containing several coloured grains. *Tetraspores* forming cloudy patches, not very obvious, arranged along the margin of the frond, tripartite, or occasionally cruciate. *Frond* composed of very minute cells, arranged in a somewhat fibrous manner, traversed by numerous empty spaces or *lacunæ*. *Substance* thickish, somewhat cartilaginous. *Colour* a beautiful, clear, bright red, varying to crimson or blood colour, and well preserved in drying.

This species is subject to very considerable variation in form, in size, and in the relative proportion of its different parts, and yet there is so much that is common to every variety, that it is rarely mistaken for anything else, although in the earlier days of marine botany, its synonymy was very much confused. The modern division into genera has certainly facilitated in this instance, the recognition of species, and there is now no need to contrast the characters of this Alga with those of *Nitophyllum laceratum*, as was necessary at the time when Mr. Turner commenced his labours. The difference in the structure of the frond and in the fructification, are so marked and obvious that no commonly attentive person can now confound these two plants.

The structure of the frond in *Rhodymenia laciniata* is considerably different from that of the typical species, and at a future time, it may become the type, as already proposed by Kützing, of a new group, to which, probably, several exotic species may belong. The large empty spaces, or lacunæ, with which the substance is permeated, which do not appear to be enlarged cells, but rather cavities, are not found in true *Rhodymeniæ*; and it is these, seen through the surface cellules, which give the appearance of areolation, noticed by Mr. Turner, when the plant is examined with a pocket lens, and which is lost if the frond be subjected to a higher magnifier.

Fig. RHODYMENIA LACINIATA:—*of the natural size.* 2. Tubercles of the ordinary kind. 3. Tubercles of larger size, occurring on plants which are imperfectly ciliate. 4. Section of a tubercle and of the frond. 5. *Spores.* 6. Part of a sorus of *tetraspores.* 7. *Tetraspores*:—*all more or less magnified.*

W.H.H. del. et lith.

Reeve, imp.

Plate CXXXIV.

RHODYMENIA PALMETTA, *Grev.*

Gen. Char. *Frond* flat, membranaceous or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick cellular pericarp, and containing a mass of minute spores, on a central placenta. 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered, or forming cloudy patches. Rhodymenia (*Grev.*),—from ῥόδεος, *red*, and ὑμην, a *membrane*.

Rhodymenia *Palmetta;* stem cylindrical, sub-simple, expanding into a fan-shaped, rose-red frond, which is more or less deeply cleft in a dichotomous manner; segments linear-wedge-shaped, with broad, rounded interstices, and a very entire, flat margin; apices, according to the state of fructification, either erose or rounded; tubercles sessile, very convex, marginal or scattered; tetraspores cruciate or tripartite, forming deep-red sori in the expanded apices.

Rhodymenia Palmetta, *Grev. Alg. Brit.* p. 88. t. 12. *Hook. Br. Fl.* vol. ii. p. 290. *Wyatt, Alg. Danm.* no. 109. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Harv. Man.* p. 61. *J. Ag. Alg. Medit.* p. 153? *Endl. 3rd Suppl.* p. 51. *Mont. Alger.* p. 68.

Sphærococcus Palmetta, *Ag. Sp. Alg.* vol. i. p. 245. *Ag. Syst.* p. 215. *Lyngb. Hyd. Dan.* p. 11. *Spreng. Syst. Veg.* vol. iv. p. 335. *Kütz. Phyc. Gen.* p. 410.

Delesseria Palmetta, *Lamour. Ess.* p. 37.

Halymenia Palmetta, *Gaill. Dict. Sc. Nat.* vol. 53. p. 361.

Fucus Palmetta, *Esper, Ic. Fuc.* p. 84. t. 40. (*excl. syn.*) *Stack. Ner. Brit.* p. 102. t. 16. *Turn. Syn.* vol. i. p. 21. *Turn. Hist. Fuc.* t. 73. *E. Bot.* t. 1120.

Fucus bifidus, *Huds. Fl. Ang.* p. 581.

β. Nicæensis, *J. Ag. l. c.* p. 153.; frond simple, or once forked, very narrow, rising from fibres.

Hab. On rocks near the verge of low water, and at a greater depth, but more frequently on the stems of *Laminaria digitata*. Annual. Summer and autumn. Not uncommon on the British shores from Orkney to Cornwall and Jersey; more abundant in the south and west. β., at Sidmouth, *Mrs. Griffiths and Miss Cutler*.

Geogr. Distr. Atlantic shores of Europe from Norway to Spain. Mediterranean Sea. (The southern stations belong, probably, to *R. corallina*.)

Descr. *Root* a broad, common disc, sometimes accompanied by fibres. *Fronds* densely tufted, rising with a more or less evident, simple or rarely divided stem, cylindrical and filiform below, compressed above, and from a quarter of an inch to one or two inches in length: this stem gradually expands at its summit into a fan-shaped, semicircular lamina, cuneate at base, and

more or less deeply and repeatedly cleft into numerous dichotomous, patent segments, with broad, rounded intervals, and more or less obtuse, often very obtuse apices. The lower segments are more or less cuneate, the upper mostly linear, with a perfectly flat and even, entire margin. Sometimes, especially in specimens that bear tubercles, the apices are more or less erose and jagged. In var. β. the disciform root sends out very numerous filiform, branching surculi, from whose sides spring, very irregularly, simple, or once forked, very narrow fronds, attenuated at the apex, and sometimes produced into long, filamentous cirrhi. *Tubercles* globose, seated on the margin or disc of the uppermost segments, with a wide pellucid border, and thick cellular pericarp, containing a very convex mass of angular spores. *Tetraspores* forming deep red blotches in the pale, expanded apices of the segments, cruciate or tripartite. *Colour*, a fine pinky red, preserved in drying. *Substance* membranaceous, somewhat rigid, and very imperfectly adhering to paper in drying.

This pretty species, though it varies as to the greater or less division of the frond, generally preserves a tolerably uniform, flabellate outline, which, taken in connexion with its bright pinky colour, and rather rigid, crisp substance, sufficiently distinguishes it from any British species. There are some closely allied forms in the Southern Ocean, as *R. corallina* and *R. flabelliformis*, which it is sometimes more difficult to separate. Among British plants the nearest in form is certainly *R. membranifolia* (*Chondrus membranifolius*, Grev.), but this may always be known by the very different colour, independently of differences in the fructification.

A marked difference exists between specimens which produce tetraspores, and those that bear tubercles, as may be seen by comparing our upper and lower figures. The former are invariably more expanded, with broad and rounded tips; the latter more drawn into a stem with shorter and denser segments, and truncate or abruptly cut tips.

A very remarkable variety, which bears a close resemblance to the var. β. of *Phyllophora Brodiæi*, is noticed above under the name *Nicæensis*, and represented at fig, 3. This always springs from decumbent fibres, which often acquire a considerable length. In the Mediterranean specimens the frond is usually quite simple, prolonged at the apex into a cirrhous appendage. British specimens are more commonly forked, and their apices, though attenuate, seldom produced into a tendril.

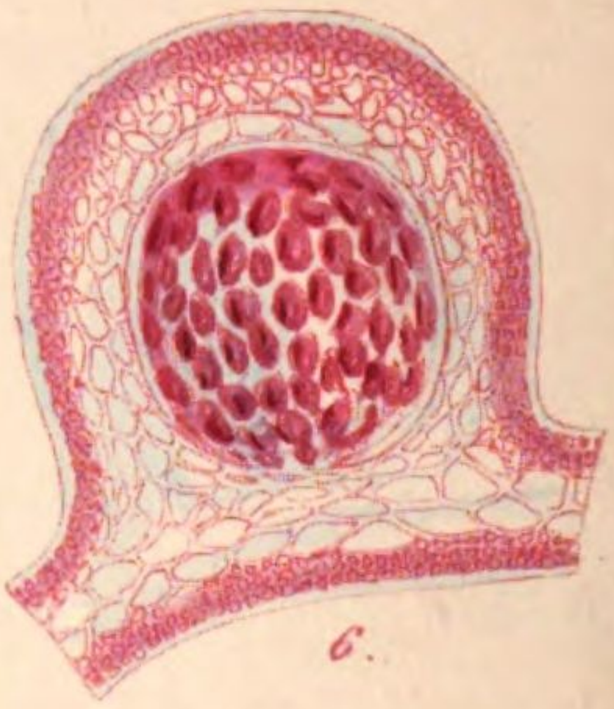
Fig. 1. RHODYMENIA PALMETTA: specimen with *sori* of tetraspores in the tips. 2. Specimen bearing *tubercles*. 3. Var. β.:—*all of the natural size.* 4. Apex of a segment, with sorus. 5. Cross section of the same. 6. Tetraspores. 7. Apex of a segment, with tubercles. 8. Section of a tubercle. 9. Spores:—*all more or less magnified.*

2.

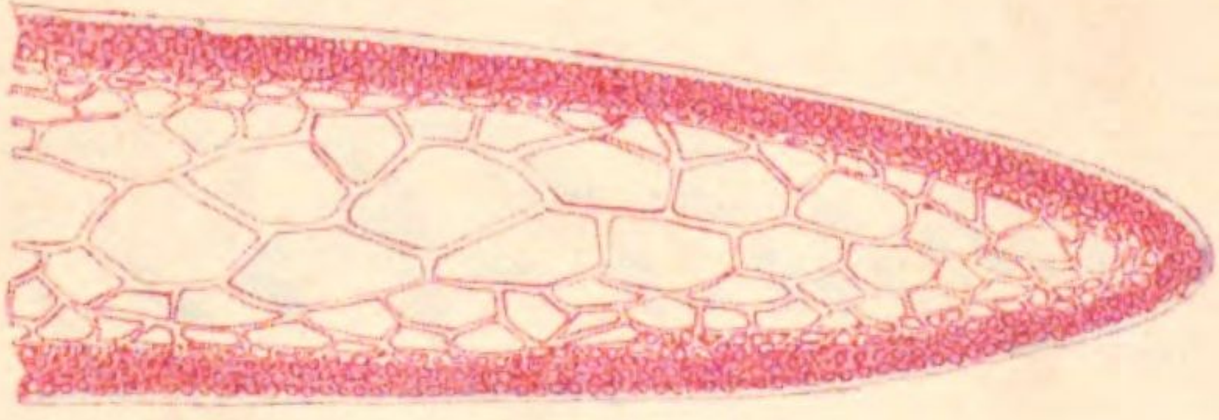
3

4.

5.



6.



8.

7.

W. H. H. del et lith.

F. Reeve, imp.

PLATE CCCVII.

RHODYMENIA CRISTATA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous or subcoriaceous, ribless, veinless, cellular; central cells of moderate size, those of the surface minute. *Fructification*: 1, convex *tubercles* (*coccidia*), having a thick, cellular pericarp, and containing a mass of minute *spores*; 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA (*Grev.*),—from ῥοδεος, *red*, and ὑμην, a *membrane*.

RHODYMENIA *cristata*; frond fan-shaped, membranaceous, subdichotomous, the segments dilated upwards, repeatedly subdivided; lesser divisions alternate, linear, laciniate at the ends and often fimbriate at the margin; tubercles spherical, marginal, sessile.

RHODYMENIA cristata, *Grev. Alg. Brit.* p. 89. *Hook. Br. Fl.* vol. ii. p. 290. *Harv. Man.* ed. 2. p. 126. *Endl. 3rd. Suppl.* p. 210.

CALLOPHYLLIS cristata, *Kütz. Sp. Alg.* p. 747.

SPHÆROCOCCUS cristatus, *Ag. Syn.* p. 29. *Lyngb. Hyd. Dan.* p. 13. t. 4. *Ag. Sp. Alg.* vol. i. p. 300. *Ag. Syst.* p. 231. *Hook. Fl. Scot.* part 2. p. 104. *Grev. Crypt. Scot.* t. 85. *Fl. Edin.* p. 296. *Kütz. Phyc. Gen.* p. 410.

FUCUS cristatus, *Herb. Linn. Turn. Hist.* t. 23.

FUCUS gigartinus, *Fl. Dan.* t. 394. *Mohr, Hist. Isl.* p. 247. *Gunn. Fl. Norv.* n. 847.

HAB. Growing on the roots and stems of *Laminariæ* in deep water, very rare. Annual. July. Sea-shore at Wick, Caithness, *Messrs. Hooker and Borrer*. Frith of Forth, *Dr. Greville*. Berwick, *Dr. Johnston*. Shetland, at Bressay, in fourteen fathoms, *Prof. E. Forbes*. Several stations in the Orkney Islands, in 8–10 fathoms, *Lieut. Thomas and Dr. M'Bain*.

GEOGR. DISTR. Arctic Sea, and shores of the North of Europe. Iceland. Eastern shores of North America, as far south as Cape Cod.

DESCR. *Root* minute, discoid. *Fronds* in British specimens from half an inch to an inch, rarely two inches long, in American from two to four or five inches, from one to three or four lines in breadth, fan-shaped or semicircular in outline, sometimes quite fastigiate, sometimes irregularly divided, some of the branches far out-topping the others, excessively branched from the base. *Branches* linear, or slightly broader upwards, subdichotomous, but very irregular in division; sometimes alternately divided, sometimes secund, and sometimes fingered, or branched in a manner compounded of all these. The lesser divisions are usually bordered with slender, jagged

segments, often beautifully fringed; and the truncate tips finely cut. *Tubercles* abundant, as large as poppy-seed, scattered along the margin of the frond, both of the smaller and larger divisions. *Tetraspores* crowded in the ultimate ramuli, on plants more slenderly branched than those that bear tubercles. *Colour* a brilliant crimson-lake, becoming brighter in fresh water, and at length discharged on long steeping. *Substance* membranaceous, soft, adhering to paper in drying.

One of the rarest of the British Algæ, almost confined with us to the northern shores of Scotland, and the Orkney and Shetland Islands, and in no place found in abundance. In general British specimens are small, rarely attaining the size of that represented in our plate, which is copied from the largest of those presented to us by Messrs. Thomas and Mac Bain. Most others which we possess are less than an inch in length; some having deeply-cut fronds, like our Fig. 2, and others comparatively little divided, like Fig. 3. All are, however, but pygmies to the specimens collected on the east coast of America, where this plant is as common as *Plocamium coccineum* is with us, and to be found as invariably ornamenting the *sea-weed pictures* made by fair Bostonians as the latter is in those manufactured at this side the Atlantic. On the American coast *R. cristata* commences in the Arctic Sea, and extends southward to Cape Cod (lat. 42°) where it suddenly disappears, as do also several other northern species of marine plants and animals. In Boston Bay it is peculiarly plentiful and of large size, and sports in a number of varieties, some of which so closely resemble the narrower and more delicate specimens of *Sphærococcus coronopifolius*, that it requires a practised eye to distinguish them without an appeal to the dissecting knife.

The most southern point in Europe at which this plant has been found is Berwick Bay (lat. 55° 45′), and there I believe it has been taken but once. This affords a remarkable contrast to its southern limit in America.

Fig. 1. RHODYMENIA CRISTATA:—*natural size*. 2. A small frond, *somewhat magnified*. 3. Another, of a broader variety. 4. Apices of laciniæ with imbedded tetraspores. 5. Tetraspores. 6. Section of a coccidium. 7. Spores. 8. Thin slice, to show internal structure of the frond:—*all magnified*.

W. H. H. del. et lith.

Reeve, imp

PLATE CXXVII.

RHODYMENIA CILIATA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick cellular pericarp, and containing a mass of minute spores, on a central placenta. 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA (*Grev.*),—from ῥόδεος, *red*, and ὑμην, a *membrane*.

RHODYMENIA *ciliata*; frond thick, subcartilaginous, dull purplish-red, rising from a short stalk, lanceolate or forked, irregularly pinnated with lanceolate or bifid segments, which are attenuated at base; the margin, and often the disc, more or less furnished with subulate cilia, in which the tubercles are imbedded; tetraspores collected in cloud-like patches dispersed over the disc; root branching.

RHODYMENIA ciliata, *Grev. Alg. Brit.* p. 90. *Hook. Br. Fl.* vol. ii. p. 291. *Wyatt, Alg. Danm.* no. 67. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Harv. Man.* p. 62. *Endl. 3rd Suppl.* p. 51.

CALLIBLEPHARIS ciliata, *Kütz. Phyc. Gen.* p. 404. t. 62. III.

DELESSERIA ciliata, *Lamour. Ess.* p. 37.

HALYMENIA ciliata, *Gaill. Dict. Sc. Nat.* v. 53. p. 361.

SPHÆROCOCCUS ciliatus, *Ag. Syn.* p. 28. *Lyngb. Hyd. Dan.* p. 12. t. 4. *Ag. Sp. Alg.* vol. i. p. 263. *Ag. Syst.* p. 221 *Spreng. Syst. Veg.* vol. iv. p. 334. *Hook. Fl. Scot.* part 2. p. 103.

FUCUS ciliatus, *Linn. Mont. Pl.* p. 136 and 519 (*excl. syn. Gmel.*). *Syst. Nat.* p. 718. *Huds. Fl. Ang.* p. 580. *Lightf. Fl. Scot.* p. 944. *Stack. Ner. Brit.* p. 90. t. 15. *Turn. Syn.* vol. i. p. 169. *Sm. E. Bot.* t. 1069. *Turn. Hist. Fuc.* t. 70. fig. *a–e.* *Linn. Trans.* vol. iii. p. 160. *Hook. Iceland Tour.* vol. ii. p. 347.

HAB. On rocks, in pools near low-water mark, and at a greater depth. Annual. Fruiting in winter. Frequent on the shores of England and of the south and west of Ireland. Near Belfast, *Dr. Drummond.* Rare in Scotland. Iona, *Lightf.* Elwich Harbour and Shapinsha, Orkney, *Lieut. Thomas* and *Dr. Mc' Bain.* Jersey, *Miss White* and *Miss Turner.*

GEOGR. DISTR. Northern Atlantic Ocean, along the shores of Greenland, Iceland, the Fœroe Islands, and of Europe from Norway to Spain.

DESCR. *Root* composed of pale red, branching and grasping fibres. *Fronds* tufted, six to twelve inches long, rising from a short, cylindrical, simple, or rarely forked stem, variable in form. In some individuals the frond forms a simple, ovato-lanceolate subacute leaf, cuneate at base, and dentato-ciliate

along the margin, but destitute of lobes; in others the main frond is once or twice forked, one to two inches broad, and more or less furnished with lateral lanceolate segments, with the margin in every part jagged in a manner between dentate and ciliate, some of the cilia short and subulate, others more or less prolonged into lobes, which are themselves dentato-ciliate. Other specimens have the main frond somewhat palmately parted, the principal divisions from a quarter to half an inch wide, and closely pinnatifid with numerous patent laciniæ, as wide as the main division, lanceolate and dentato-ciliate, acute, and much attenuated at base. The surface of the frond is either smooth or more or less muricated with cilia. *Substance* thick, rigid and crisp when recent, imperfectly adhering to paper in drying. *Colour* a deep, full red, semi-transparent when fresh, becoming much darker in the herbarium. The cells of the interior are oblong or narrow elliptical, in several rows, rather large and filled with large grains. *Tubercles* constantly lodged in the marginal cilia, near the apex, which is turned aside and projects like the bill of a bird. The sporular mass is beautifully arranged in moniliform strings, radiating from a central point; the terminal cells being at length formed into spores. *Tetraspores* forming cloud-like stains in various parts of the frond, oblong, transversely zoned.

Rhodymenia ciliata is of a thicker substance, and more rigid than any other British species of this genus, and is, moreover, distinguished from all of them, except *R. jubata*, by the fibrous character of the root. *R. jubata*, indeed, was long considered to be merely an extraordinary variety of *R. ciliata* until characters were satisfactorily ascertained by Mrs. Griffiths, which seem permanently to separate it. These consist in a softer substance, a duller colour, and a difference in the fructification, and also in the season at which the plant is in perfection. It is only the smaller and narrower varieties of *R. ciliata* which can be confounded with *R. jubata*; the more usual form, which our plate represents, looks abundantly different.

Fig. 1. RHODYMENIA CILIATA. 2. A segment in fruit:—*both of the natural size.* 3. Fertile cilia, with tubercles. 4. Section of a tubercle. 5. Strings of spores, from the same. 6. Longitudinal section of the frond. 7. Transverse section. 8. Tetraspores:—*all more or less magnified.*

Plate CLXV.

W. H. H. del. et lith.

Lowe, Print. 30, Poland St.

PLATE CLXXV.

RHODYMENIA JUBATA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick, cellular pericarp, containing a mass of minute spores on a central placenta. 2, *tetraspores*, either zoned or triparted, imbedded among the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA (*Grev.*),—from ροδεος, *red*, and υμην, a *membrane*.

RHODYMENIA *jubata*; frond thickish, flaccid, subcartilaginous, dull-red, linear-lanceolate, much attenuated or cirrhose at the apex, vaguely pinnate with laciniæ of the same form; the margins, and often the disk, beset with subulate or filiform cilia, in which both tubercles and tetraspores are produced on distinct plants; root fibrous, branching.

RHODYMENIA jubata, *Grev. Alg. Brit.* p. 91. *Hook. Br. Fl.* vol. ii. p. 291. *Wyatt, Alg. Danm.* no. 18. *Harv. in Mack. Fl. Hib.* part 3, p. 194. *Harv. Man.* p. 63. *J. Ag. Alg. Medit.* p. 153. *Endl. 3rd Suppl.* p. 51.

CALLIBLEPHARIS jubata, *Kg. Phyc. Gen.* p. 404.

SPHÆROCOCCUS jubatus, *Grev. Scot. Crypt.* t. 359.

SPHÆROCOCCUS ciliatus, vars. jubatus, linearis, angustus, and spinosus, *Ag. Sp. Alg.* vol. i. p. 264. *Ag. Syst.* p. 221.

FUCUS jubatus, *Good. and Wood. Lin. Trans.* vol. iii. p. 162. t. 17. *Stack. Ner. Brit.* p. 51. t. 11.

FUCUS ciliatus, vars. jubatus, lanceolatus, angustus, and spinosus, *Turn. Hist.* t. 70. fig. *f–h*.

HAB. On the bottoms of rock-pools between tide marks, chiefly near low-water mark; also among the roots of *Laminaria digitata*. Annual. Fruiting in summer. Frequent on the shores of the British islands from Orkney to Cornwall, and Jersey.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Root* composed of densely matted, branching fibres. *Fronds* densely tufted, very variable in form. They all rise with a cylindrical stem which is from one to five or six inches in length, becoming gradually wider and more compressed upwards and expanding into a flat, linear-lanceolate, very narrow, simple or forked frond, which is much drawn out at the apex, and more or less regularly pinnate with laciniæ resembling itself. These *pinnæ* are often secund; and often very irregularly placed. Their margins and disk are more or less densely clothed with filiform cilia from 1–2 lines to an inch or more in length, branching or simple; in some varieties produced into cirrhi 3–6 inches long or more, which clasp round each other and round neighbouring Algæ in a very entangled manner. Sometimes the whole frond is cylindrical, much and irregularly branched; the branches

spreading and set with spine-like ramuli. *Tubercles* spherical, sessile on the sides of the cilia. *Tetraspores* contained in the cilia, oblong, transversely zoned. *Substance* cartilaginous, but flaccid, soon altering in fresh water. *Colour* a dull red, which quickly becomes orange in fresh water, and changes to brownish in drying; in which state the plant, if placed under pressure, adheres to paper, but shrinks considerably.

This species, first distinguished by Micheli, received the specific name which it now bears from Messrs. Goodenough and Woodward, who described it in their memoir on the species of *Fucus* in the Linnæan Transactions. Mr. Turner in his Synopsis, and subsequently in his great work, regards it as merely a variety of *R. ciliata*, to which species, no doubt, it is very closely allied. Mrs. Griffiths, however, clearly points out characters by which they may be distinguished, namely, the more flaccid substance and duller colour of *R. jubata*, and the different position of the *tetraspores*, these being in the present species confined to the cilia, and in *R. ciliata* immersed in the laciniæ of the frond. To this may be added that *R. ciliata* is a winter plant, and *R. jubata* in perfection in summer.

The *tubercles* of this species are rare. I have only gathered them in a locality at Miltown Malbay (in rock-pools opposite "Billowville"), but in that station I found them abundantly, first in 1831, afterwards in 1847. The plant is common on most of the British shores, but scarcely ever found with *tubercles*.

Few plants are more sportive in appearance. Our plate represents some of the more common forms: but specimens are often found in which the cilia are much more copiously developed, or where the whole frond is exceedingly slender, filiform, and entangled. Such examples may at first sight be mistaken for luxuriant tufts of *Gigartina acicularis*.

Fig. 1. RHODYMENIA JUBATA; fronds:—*of the natural size.* 2. A cilium, with tubercle. 3. Vertical section of a tubercle. 4. Tetraspores. 5. Section of the frond:—*all more or less magnified.*

W.H.H. del et lith.

R.B & R. imp

Plate CCXVII.

RHODYMENIA? PALMATA, *Grev.*

Gen. Char. *Frond* flat, membranaceous, or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*), having a thick, cellular pericarp, and containing a mass of minute spores, on a central placenta; 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered or forming cloudy patches. Rhodymenia (*Grev.*),—from ῥοδεος, *red*, and ὑμην, a *membrane*.

Rhodymenia *palmata*; frond coriaceous or submembranaceous, purple, broadly wedge-shaped, irregularly cleft, palmate, or dichotomous, sometimes repeatedly laciniate; the margin flat and even, sometimes winged with leaflets; granules distributed over the whole frond in cloud-like spots.

Rhodymenia palmata, *Grev. Alg. Brit.* p. 93. *Hook. Br. Fl.* vol. ii. p. 291. *Wyatt, Alg. Danm.* no. 110. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Harv. Man.* p. 63.

Sphærococcus palmatus, *Kütz. Phyc. Gen.* p. 409. t. 63. f. 1.

Halymenia palmata, *Ag. Syn.* p. 55. *Ag. Sp. Alg.* vol. i. p. 204. *Ag. Syst.* p. 242. *Spreng. Syst. Veg.* vol. iv. p. 333. *Hook. Fl. Scot.* part 2. p. 107. *Post.* and *Rupp.* p. 18.

Delesseria palmata, *Lamour. Ess.* p. 37.

Ulva palmata, *Dec. Fl. Fr.* vol. ii. p. 12. *With.* vol. iv. p. 123. *Lyngb. Hyd. Dan.* p. 24. *Grev. Fl. Edin.* p. 298.

Fucus palmatus, *Linn. Sp. Pl.* p. 1630. *Huds. Fl. Ang.* p. 579. *Lightf. Fl. Scot.* p. 933. t. 27. *Good. and Woodw. Linn. Trans.* vol. iii. p. 163. *Gunn. Fl. Norv.* vol. ii. p. 69. *Turn. Syn.* p. 175. *Turn. Hist.* t. 115. *E. Bot.* t. 1306. *Hook. in Fl. Lond.* New Series, with a figure.

Fucus ovinus, *Gunn. Fl. Norv.* vol. i. p. 96. *Mohr. Hist. Isl.* p. 245.

Fucus caprinus, *Fl. Dan.* t. 1128. *Esper. Ic.* p. 146. t. 74.

Fucus bullatus, *Fl. Dan.* t. 770.

Fucus rubens, *Esper. Ic.* t. 75.

Fucus dulcis, *Gmel. Hist.* p. 189. t. 26. *(fide Turner.)*

Var. β. *marginifera*; frond oblong, subsimple, proliferous at the margin. (*Tab. Nost. CCXVII.*)

Fucus palmatus, *Stack. Ner. Brit.* p. 54. t. 12.

Ulva caprina, *Gunn. Fl. Norv.* vol. ii. p. 126. t. 6. f. 4.

Var. γ. *simplex*; frond undivided, wedge-shaped.

Halymenia palmata δ, simplex, *Ag. Syn.* p. 36.

Var. δ. *Sarniensis*; frond laciniated, the segments narrow and sublinear.

Fucus Sarniensis, *Mert. in Roth. Cat. Bot.* vol. iii. p. 103. t. 1. *Turn. Hist. Fuc.* t. 44.

Fucus delicatulus, *Fl. Dan.* t. 1190.

Sphærococcus sarniensis, *Hook. Fl. Scot.* part 2. p. 103. *Kütz. Phyc. Gen.* p. 409.

Var. ϵ. *soboliferus*; frond stipitate, membranaceous, the branches very narrow below, much divided, expanding upwards into wedge-shaped, jagged and laciniate lobes.—(*Tab. Nost. CCXVIII. fig.* 2.)

Rhodymenia sobolifera, *Grev. Alg. Brit.* p. 95. *Hook. Br. Fl.* vol. ii. p. 292. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Harv. Man.* p. 63.

Sphærococcus soboliferus, *Kütz. Phyc. Gen.* p. 409.

Halymenia sobolifera, *Ag. Syn.* p. 36. *Ag. Sp. Alg.* vol. i. p. 218. *Ag. Syst.* p. 246. *Hook. Fl. Scot.* part 2. p. 107.

Ulva sobolifera, *Lyngb. Hyd. Dan.* p. 27.

Fucus soboliferus, *Fl. Dan.* p. 1065. *Turn. Hist.* t. 45. *Wahl. Fl. Lapp.* p. 947. *E. Bot.* t. 2133.

Hab. On rocks within tide marks; and on the stems of *Fuci*, *Laminariæ*, &c. Annual or biennial. Winter and spring. Common on all the British shores. β. and γ. on the stems of *Laminariæ*. ϵ. on *Fucus serratus*.

Geogr. Dist. Shores of Northern and Arctic Europe. Iceland. Greenland. Eastern shores of North America. Unalaschka. Kurile Islands. Kamskatka. Falkland Islands. Tasmania.

Descr. *Root*, a small disc. *Fronds* solitary or tufted, rising from a more or less evident subcylindrical stipe, from a line to half an inch long, or more, which soon flattens into the wedge-shaped base of the lamina; *lamina* broadly wedge-shaped or fan-shaped, somewhat fastigiate, more or less deeply cloven into numerous segments, which are often again and again divided in a palmate or subdichotomous manner. So variable is the degree of division in different specimens that it is impossible to write a general character which shall embrace all the forms. In some, the frond is quite simple, broadly oval or wedge-form; in others it is cleft into four or five principal segments, the margin emitting leaf-like lobes:—these varieties are usually of large size, 12–18 inches long, of a coriaceous substance and dark colour. Other states (vars. δ. and ϵ.) are thinner in substance, and excessively divided, the lower segments filiform, the upper split into innumerable narrow ribbons, often not half a line in breadth; these sometimes expand again into wedge-shaped lobes, laciniated at the extremity; and sometimes the whole frond is excessively branched, and none of its divisions more than half a line in breadth; the narrow and laciniate varieties are seldom more than five or six inches in length. *Fructification*; *tetraspores*, half immersed in the frond, forming large cloudy patches dispersed over the whole frond. Besides these, an imperfect *tubercular* fructification (?) is sometimes found, forming circular spots surrounded by a discolouration. Within the circle are congregated innumerable minute, dark-coloured pustules, immersed in the frond, slightly prominent and either empty, or containing a mass of granular endochrome. *Substance* in the larger varieties leathery, in the smaller membranaceous; the latter adhering closely to paper. *Colour*, a purplish or brownish red; sometimes pinky.

Fig. 1. Rhodymenia palmata, var. β.:—*of the natural size.* 2. Portion of the surface with tubercles (?). 3. Section of the frond and *tubercles* (?). 4. Portion of the surface, with part of a *Sorus*. 5. Tetraspores:—*all more or less magnified.*

2.

W.H.H. del et lith.

R.B & R. imp.

PLATE CCXVIII.

RHODYMENIA PALMATA; *vars. a and ϵ.*

(*For description, see last folio.*)

This and the preceding plate represent three forms of *Rhodymenia palmata*, the well known *Dulse* of the Scotch, and *Dillisk* of the Irish;—and had I figured all the characteristic specimens which my Herbarium supplies, I might easily have extended the illustrations to a dozen plates. To connect Fig. 1. of Pl. CCXVII, with Fig. 3. of Pl. CCXVIII, by a full suite of specimens would require many figures. At first sight it will scarcely be supposed that they can belong to the same plant, and yet these figures by no means exhibit the extreme of variation, for there are varieties more simple than the one and more finely divided than the other. There is one state (var γ.) in which the frond is absolutely a simple elliptical leaf, without any division, or with a faint tendency to lobation at their apex. And there is another (var ϵ.) which is occasionally cut into multitudes of many-cleft ribbon-like segments, in no place more than half a line in width. And yet these two forms can be clearly brought together by specimens of intermediate character.

When such varieties are seen in a dried state in the herbarium, they appear so different that one may anticipate much difficulty in tracing the limits of the species. And it might indeed be difficult to do so with the assistance merely of dried specimens and of the descriptions of authors. But on the shore the collector experiences no such difficulty. If he has once seen and *tasted* a piece of Dulse, the characters, irrespective of form, are too well marked to allow of his puzzling himself with mere variations in outline. And what is very remarkable, the broad and slightly divided varieties may often be found growing side by side with the finely cut narrow ones. I have frequently noticed that where the Dulse grows on rock, it is broad and slightly divided; but when it grows on *Fucus serratus*, on the same rock, it is cut into the form called *sobolifera*. This would seem to prove that habitat had some effect, or, in other words, that the root of this

seaweed was something more than a mere holdfast. Yet epiphytic (or parasitic) attachment has not always the same effect on this plant; for the simplest form of this species is undoubtedly found on the stems of *Laminaria digitata*, and authors give the same stems as a habitat for the finely cut variety, *sobolifera*. My own experience would confine this variety to the stems of *Fucus serratus* and *vesiculosus*.

The extensive list of synonyms given in the description shows a large number of book species formed out of the varieties of this plant. Most of these are admitted by modern authors to be, what I have considered them, merely forms of *R. palmata*. But my var ϵ. has hitherto, in British works, maintained its place under the name *R. sobolifera*. I can only say that I can in no respect distinguish specimens which I have received from Orkney, the original British habitat of *R. sobolifera*, from others collected on the Irish coast which I have clearly traced, through connecting forms, into the common *palmata*. I am therefore at a loss to know on what character to uphold *sobolifera*. Colour and substance are here too variable to allow of their being taken into account; some of the most pinky and delicately membranous specimens which I possess, have the outline of the true *palmata*, not of *sobolifera*.

In Ireland and Scotland this plant is much used by the poor, as a relish with their food. It is commonly dried, in its unwashed state, and eaten raw, the flavour being brought out by long chewing. On many parts of the west coast of Ireland, it forms the only addition to potatoes, in the meals of the poorest class. The variety which grows on mussel shells between tide marks is preferred, being less tough than other forms, and the minute mussel shells and other small shell-fish which adhere to its folds are nowise unpleasing to the consumers of this simple luxury, who rather seem to enjoy the additional *gout* imparted by the cranched mussels. In the Mediterranean this plant is used in a cooked form, entering into ragouts and made dishes; and it forms a chief ingredient in one of the soups recommended, under the name of "St. Patrick's Soup," by M. Soyer to the starving Irish peasantry.

Fig. 1. RHODYMENIA PALMATA, var *a*. 2. The same, var. ϵ:—*both the natural size.*

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PLATE LXI.

SPHÆROCOCCUS CORONOPIFOLIUS, *Ag.*

GEN. CHAR. *Frond* cartilaginous, compressed, two-edged, linear, distichously branched, with an internal rib, cellular; central cells fibrous; medial polygonal; those of the periphery minute, disposed in filaments. *Fructification*; 1, spherical *tubercles* (*coccidia*) having a thick, fibro-cellular pericarp, and containing a mass of minute spores on a central placenta; 2, *tetraspores*? (unknown). SPHÆROCOCCUS (*Stack.*)—from σφαῖρα a *sphere* or *globe*, and κόκκος, *fruit*.

SPHÆROCOCCUS *coronopifolius*; frond very much branched, branches alternate or subdichotomous, fan-shaped, multifid, ending in acute laciniæ, fringed with cilia; tubercles immersed in the cilia.

SPHÆROCOCCUS coronopifolius, *Ag. Sp. Alg.* vol. i. p. 291. *Ag. Syst.* p. 229. *Grev. Alg. Brit.* p. 138. t. 15. *Hook. Br. Fl.* vol. ii. p. 304. *Harv. in Mack. Fl. Hib.* part. 3. p. 203. *Wyatt, Alg. Danm.* n. 122. *Harv. Man.* p. 79. *J. Ag. Alg. Medit.* p. 154. *Endl.* 3*rd* Suppl. p. 52.

GELIDIUM coronopifolium, *Lamour. Ess.* p. 41.

RHYNCHOCOCCUS coronopifolius, *Kütz. Phyc. Gen.* p. 403. t. 61. f. 1.

FUCUS coronopifolius, *Good. et Woodw. in Linn. Trans.* vol. iii. p. 185. *Stack. Ner. Brit.* p. 82. t. 14. *Turn. Syn.* vol. ii. p. 288. *Turn. Hist.* t. 122. *E. Bot.* t. 1478. *Esper, Ic.* p. 60. t. 138. *Lamour. Dis.* t. 33.

FUCUS coronopi facie, *Raii Syn.* p. 45. n. 23.

FUCUS cartilagineus, *Huds. Fl. Ang.* p. 586 (*not of Linn.*). *Desf. Fl. Atlant.* p. 425.

HAB. On rocky sea shores, at extreme low-water mark, and at a greater depth; mostly cast on shore after a gale. Perennial. Summer and Autumn. Frequent on the southern shores of England, and southern and western shores of Ireland. Belfast Bay, *Mr. Templeton*. Larne, *Dr. Drummond*. Very rare in Scotland; Bute *Dr. Greville*. Ardrossan, Kilbride, and Arran, *Rev. D. Landsborough*. Jersey, *Miss Turner* and *Miss White*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Root* a flattish disc. *Fronds* from six to twelve or even eighteen inches in length, from two to four lines in width, very much branched, distichous; the main stems compressed, thickened and two-edged below, becoming thinner and flatter in their upper parts, irregularly divided in a manner between dichotomous and alternate, the upper branches once or twice forked, gradually narrower, and ending in fan-shaped many-cleft lesser branches. *Laciniæ* tapering to an acute point, their margins, and sometimes those of the older parts of the frond, fringed with slender cilia from half a line to a line in length, simple, acute, and spreading, in some of which *tubercles* are imbedded. *Tubercles* spherical, imbedded in the cilia below the apex, which

is slightly produced beyond them, forming an oblique mucro; their walls very thick, the inner portion formed of largish, polygonal cells, the outer of a stratum of closely packed vertical filaments. A very dense, broad, more or less clearly defined, sometimes obsolete mid-rib runs through the substance of the frond, and faint lateral, oblique veins proceed from it; both formed of elongated, cylindrical cellules, disposed in longitudinal fibres. The cells composing the middle stratum of the frond are polygonal, gradually becoming smaller outwards; and those of the periphery are very minute, and arranged in closely packed, vertical filaments. *Colour* a fine scarlet pink, dark in the main branches. *Substance* cartilaginous, imperfectly adhering to paper in drying.

In reforming the genus *Sphærococcus*, which, in the work of Agardh included a large number of species now dispersed into many genera, and many of which had little in common with each other except the spherical fruit, Dr. Greville confined the amended genus to the *S. coronopifolius* and to *S. crinitus*, Gm. The first of these, being the best known, is to be considered the type. Its structure is peculiar; under a pocket lens may be observed running through the branches the faint appearance of a mid-rib, connected with the margin by oblique lateral veins, both of which were first observed by Mr. Sowerby. By making a transverse section, and applying a more powerful glass, this venation is seen to be caused by an internal rib, composed of denser and more elongated cells than the rest of the frond; and if the internal structure of the frond affords, in the Florideæ, the surest generic characters, the presence of such a rib ought to be essential to the genus. Judged by this rule, my *S. australis* (Harv. in Hook. Lond. Journ. vol. iii. p. 445), notwithstanding that outwardly it bears a close resemblance to *S. coronopifolius*, must be removed from the genus, its internal structure being extremely lax, and more like that of *Gracilaria*, a group which, if allowed to retain all the species which seem disposed to drop into it, will soon be as anomalous as *Sphærococcus* was formerly.

S. coronopifolius appears to have been first noticed by Ray, in whose 'Synopsis' it is described. It is said to be unknown on the eastern coast of England. In Ireland it is more common, and is found at both sides of the island. In Scotland it is extremely rare.

Fig. 1. SPHÆROCOCCUS CORONOPIFOLIUS:—*natural size.* 2. Portion of a branchlet. 3. Section of a tubercle. 4. Spores. 5. Cross section of a main branch, in its lower part. 6. Longitudinal section of the same:—*all more or less highly magnified.*

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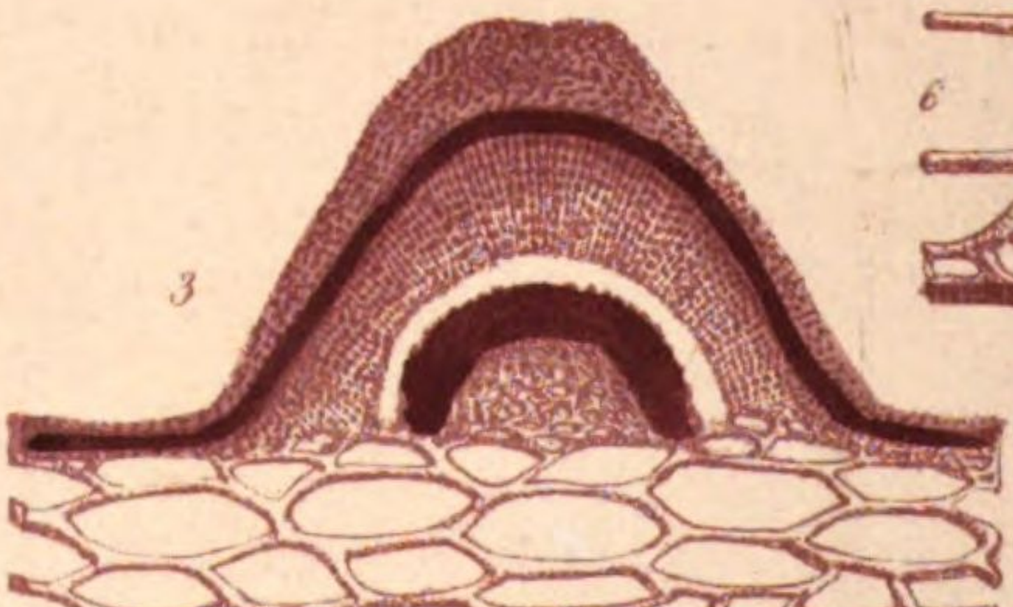
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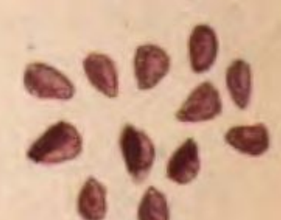
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PLATE XV.

GRACILARIA MULTIPARTITA, *J. Ag.*

GEN. CHAR. *Frond* filiform or rarely flat, carnoso-cartilaginous, continuous, cellular; the central cells very large, empty or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds, on distinct individuals; 1, convex tubercles (*coccidia*), having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores,* zoned or tripartite, imbedded in the cells of the surface. GRACILARIA (*Grev.*),—from *gracilis,* slender.

GRACILARIA *multipartita*; frond flat, tender, semi-transparent, brittle, dull purplish red, deeply cleft in an irregularly dichotomous or palmate manner; the branches linear-wedge-shaped, apices acute, tubercles conical, very prominent, scattered over the segments.

GRACILARIA multipartita, *J. Ag. Alg. Medit.* p. 151.

GRACILARIA polycarpa, *J. Ag. l. c.* p. 151.

PLOCARIA multipartita, *Endl. 3rd Suppl.* p. 51.

PLOCARIA polycarpa, *Endl. l. c.* p. 51.

CHONDRUS multipartitus, *Grev. Syn.* p. lvi. *Harv. in Hook. Journ. Bot.* vol. i. p. 155.

SPHÆROCOCCUS multipartitus, *Ag. Sp. Alg.* vol. i. p. 247. *Ag. Syst.* p. 212.

SPHÆROCOCCUS polycarpus, *Grev. Sc. Cryp. Fl.* t. 352.

RHODOMENIA polycarpa, *Grev. Alg. Brit.* p. 87. *Hook. Br. Fl.* vol. ii. p. 289. *Harv. Man.* p. 61. *Wyatt, Alg. Danm.* no. 108.

FUCUS multipartitus, *Clem. Hist.* p. 311.

FUCUS granatus, *Turn. Hist.* t. 215 (*excl. syn. Lamx.*).

FUCUS æruginosus, *Turn. Hist.* t. 147.

HAB. On rocks and stones in the sea, in muddy places, chiefly estuaries; near low-water mark, and at a greater depth. Very rare. Annual. August and September. Shore under Tait's Hill, Plymouth, *Miss Hill* (1802); *Mr. R. Sconce.* Plymouth Sound, abundantly, *Rev. W. S. Hore, Mr. J. W. Rohloff, Dr. Cocks.* Whitsand Bay, *Dr. Jacob.* Dredged in Salcombe Bay, *Mrs. Wyatt.*

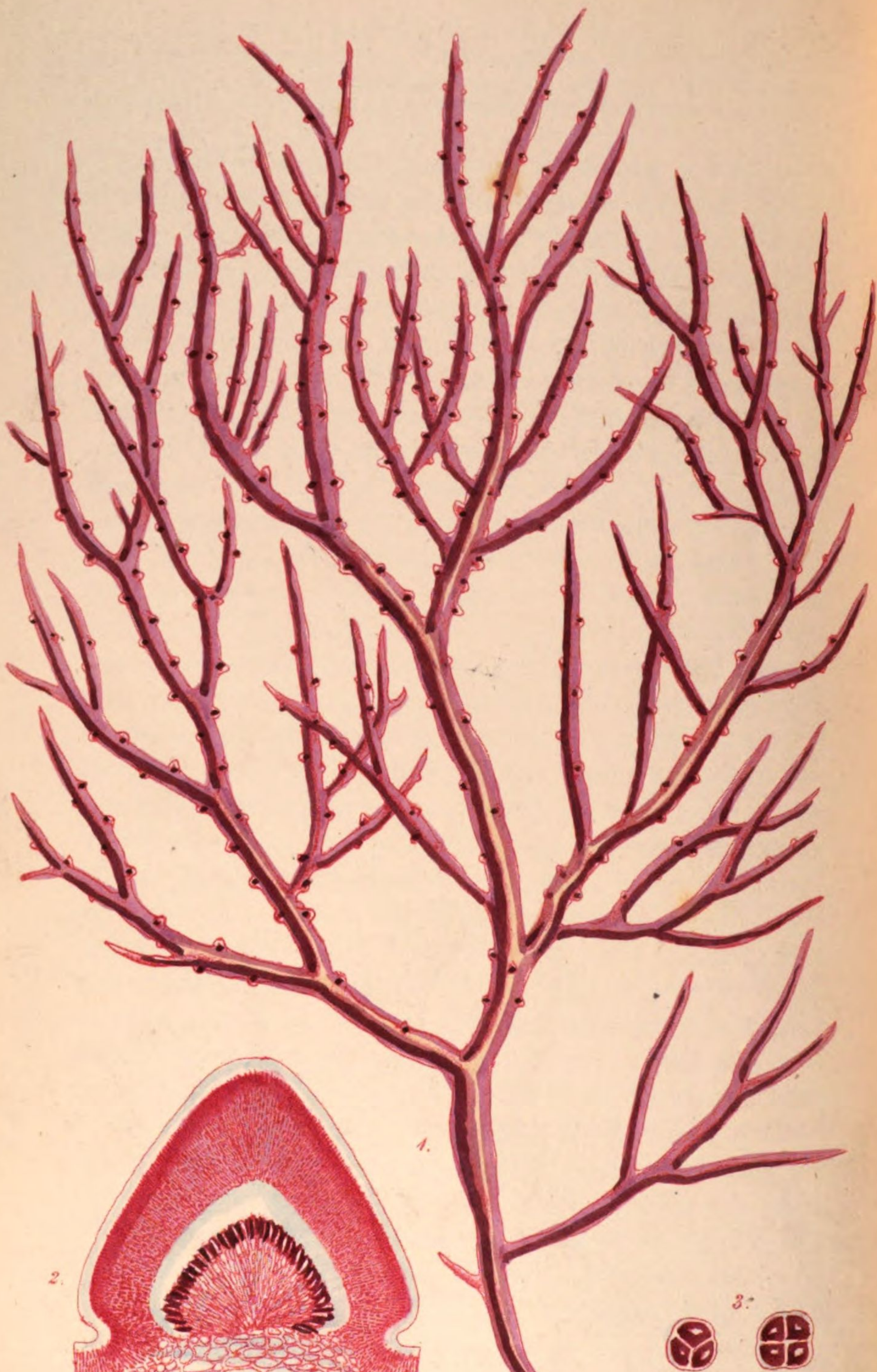
GEOGR. DISTR. Shores of Europe from the south of England to Spain. East coast of North America, from New York to Florida. California. West Indies (*Miss Dix*). Pernambuco, *Areschoug.* Red Sea, *Lord Valentia.* Mauritius, *Mrs. Telfair.*

DESCR. *Root,* a thin spreading disk. *Frond* four to twelve inches long, flat, cleft nearly to the base in an irregularly dichotomous manner; sometimes vaguely divided, or palmate; sometimes having the lesser segments secund, and often margined with horizontal laciniæ. The breadth of the frond varies from half a line to more than half an inch; the thickness is commonly nearly the tenth of an inch. When freshly gathered it is "thick, cartilaginous, tender, semitransparent, and very brittle"; but when dry, it becomes tough and shrinks considerably. The *tubercles* are large, conical, depressed at the apex, very prominent and abundantly dispersed over the frond. They contain, under a thick pericarp composed of vertical, densely

packed filaments, a roundish mass of minute spores spread upon a hemispherical central placenta. The *tetraspores* are scattered over the whole surface of the plant which produces them, and are mostly triangularly divided. *Colour* a dull purple, becoming greenish on exposure.

I am indebted to M. Lenormand for having pointed out to me the identity between the *Rhodomenia polycarpa* of Greville, and the older *Fucus multipartitus* of Clemente, which Greville includes in his genus *Chondrus*; and also for a suite of beautifully preserved specimens, showing the changes which this most variable plant assumes, according to the circumstances under which it grows; and I have had the additional advantage of consulting, in the Herbarium of Mrs. Griffiths, an authentic specimen of *Fucus multipartitus*, from Cadiz, which is in all respects similar to some of our British individuals. Prof. J. Agardh, while he transfers the *Rhod. polycarpa* and *Chondrus multipartitus* of Greville to the reformed genus *Gracilaria*, retains both species. With respect to the *Fucus æruginosus* of Turner, which I had been in the habit of regarding as the typical state of *G. multipartita*, and which I had hitherto looked upon as truly distinct from our British *R. polycarpa*: a more careful examination and a comparison of multitudes of specimens from very distant parts of the world, induce me now to regard this as merely a variety originating probably from the plant's growing in rougher water, beyond the influence of the estuaries; and consequently acquiring a firmer texture, and narrower segments: the marginal processes are common to all the varieties. A still more remarkable form of this species is Agardh's var. δ. *angustissimus*, of which specimens have been kindly sent to me by Prof. J. W. Bailey, of New York, who obtained them at Providence, Rhode Island, where vast quantities of this variety grow on sandy bottoms. These specimens are quite as slender as *Gracilaria confervoides*, and nearly cylindrical, excessively divided, and forming bushy tufts. But that the very narrow ones are mixed with others, which show a decided return to the common form of the species, one would never suspect them to belong to it; yet some are covered with the characteristically abundant tubercles. Mr. Hore has found at Plymouth, as Mrs. Griffiths informs me, specimens almost equally narrow.

Fig. 1. GRACILARIA MULTIPARTITA:—*natural size*. 2. A portion, showing the pitted appearance of the surface:—*slightly magnified*. 3. Section of frond and tubercle, to show the structure of both. 4. Spores from the tubercle. 5. Tetraspores. 6. Section of a thicker portion of the frond:—*all highly magnified*.



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W. H. H. del et lith.

Reeve Benham & Reeve imp.

PLATE CCV.

GRACILARIA COMPRESSA, *Grev.*

GEN. CHAR. *Frond* filiform, or rarely flat, carnoso-cartilaginous, continuous, cellular; the central cells very large, empty, or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface. GRACILARIA (*Grev.*)—from *gracilis*, slender.

GRACILARIA *compressa*; frond succulent, brittle, somewhat compressed, alternately or subdichotomously branched; branches long and mostly simple, tapering to a fine point; tubercles ovate or subglobose, sessile, scattered plentifully over the branches; tetraspores tripartite or cruciate.

GRACILARIA compressa, *Grev. Alg. Brit.* p. 125. *J. Ag. Alg. Medit.* p. 151.

PLOCARIA compressa, *Endl. 3rd Suppl.* p. 51. *Mont. Fl. Algier.* p. 71.

GIGARTINA compressa, *Hook. Br. Fl.* vol. ii. p. 299. *Wyatt, Alg. Danm.* n. 25. *Harv. Man.* p. 74. *De Not. Alg. Ligust.* p. 14.

SPHÆROCOCCUS compressus, *Ag. Sp. Alg.* vol. i. p. 308. *Ag. Syst.* p. 233. *Spreng. Syst. Veg.* vol. iv. p. 338. *Kütz. Phyc. Gen.* p. 408.

SPHÆROCOCCUS lichenoides, *Grev. Crypt. Fl.* t. 341. *(not of Agardh.)*

HAB. Cast on shore from deep water, attached to corallines, &c. Annual. Summer. Very rare. At Sidmouth, *Mrs. Griffiths* (1813) and *Miss Cutler*. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea.

DESCR. *Root*, a small expanded callus. *Fronds* several from the same base, six to twelve inches long or more, from a line to two lines in diameter, brittle, much, but very irregularly, branched. *Branches* sub-compressed, sometimes nearly distichous, frequently more or less quadrifarious, alternate or secund, rarely opposite, simple or forked, elongated and gradually tapering to an acute point, sometimes much attenuated, naked or furnished with a few scattered subulate ramuli, or bearing (in large specimens) a second or third series of lesser branches. *Tubercles* large and prominent, obtusely conical, sessile on the branches, over which they are very plentifully scattered, containing, under a thick wall composed of radiating fibres, a conical mass of minute *spores* attached to filaments issuing from a central point. *Tetraspores* imbedded in the surface cells of distinct plants, irregularly dispersed, roundish, either tripartite or cruciate. *Substance*, when fresh, very tender and brittle, succulent, and breaking by its own weight if hastily removed from the water; becoming tough in drying. *Colour*, a transparent, dull red, which becomes much brighter after the plant has been steeped in fresh water.—It adheres to paper in drying, and shrinks considerably.

This beautiful plant was added to the British Flora by Mrs. Griffiths in the year 1813, and has been occasionally, but very irregularly, found in the same locality since that period, In some seasons it makes its appearance in considerable plenty, and may not again be seen for several years. I believe it has always been found among rejectamenta, as if cast up from deep water. The south coast of England is perhaps its northern limit. On the French and Spanish coasts, and especially in the Mediterranean, it is much more abundant; but British specimens are quite as large and as abundantly covered with fructification as any from more southern stations. In many characters it bears a close resemblance to the *G. lichenoides* of the East Indies, with which Dr. Greville formerly associated it; and Mrs. Griffiths, in the belief that these plants were identical, prepared a *pickle* and a *preserve*—both of which proved excellent in flavour as well as ornamental—from our British *G. compressa*; thus proving that our plant is quite as valuable for the table as its Indian cousin.

G. compressa has something the aspect of *G. confervoides*, but may always be known by its more succulent frond, and very different substance. It is as soft and brittle, as *G. confervoides* is hard and tenacious. It also bears some resemblance to the narrow variety of *G. multipartita*, but is more cylindrical, and of a different, and much brighter colour.

Fig. 1. GRACILARIA COMPRESSA:—*the natural size.* 2. Section of a tubercle.
3. Tetraspores:—*both highly magnified.*

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PLATE LXV.

GRACILARIA CONFERVOIDES, *Grev.*

GEN. CHAR. *Frond* filiform or rarely flat, carnoso-cartilaginous, continuous, cellular; the central cells very large, empty, or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface. GRACILARIA (*Grev.*)—from *gracilis*, slender.

GRACILARIA *confervoides*; frond cartilaginous, cylindrical, filiform, irregularly (often very slightly) branched; branches long, subsimple, erect; ramuli few, tapering at each end; tubercles scattered, sessile, roundish, subacute.

GRACILARIA confervoides. *Grev. Alg. Brit.* p. 123.

HYPNEA confervoides, *J. Ag. Alg. Medit.* p. 149. *Endl. 3rd Suppl.* p. 50.

SPHÆROCOCCUS confervoides, *Ag. Sp. Alg.* vol. i. p. 303. *Syst.* p. 232. *Spreng. Syst. Veg.* vol. iv. p. 338. *Kütz. Phyc. Gen.* p. 408. t. 60. iii.

GIGARTINA confervoides, *Lamx. Ess.* p. 48. *Lyngb. Hyd. Dan.* p. 43. *Hook. Brit. Fl.* vol. ii. p. 299. *Wyatt, Alg. Danm.* no. 75. *Harv. in Mack. Fl. Hib.* part 3. p. 200. *Harv. Man.* p. 74.

FUCUS confervoides, *Linn. Sp. Pl.* p. 1629. *Syst. Nat.* vol. ii. p. 719. *With.* vol. iv. p. 114. *Turn. Syn.* vol. ii. p. 328. *E. Bot.* t. 1668. *Turn. Hist.* t. 84. *Esper, Ic. Fuc.* vol. i. p. 136. t. 68. *Stack. Ner. Brit.* p. 96. t. 15.

FUCUS longissimus, *Gm. Hist.* p. 134. t. 13. *Stack. Ner. Brit.* p. 99. t. 16.

FUCUS verrucosus, *Huds. Fl. Ang.* p. 588. *Gm. Hist.* 136. t. 14. f. 1. *Stack. Ner. Brit.* p. 26. t. 8.

FUCUS albidus, *Huds, Fl. Ang.* p. 588 (*Excel. Syn. Raii.*) *Good. and Woodw. in Linn. Trans.* vol. iii. p. 210. *Esper, Ic.* p. 147. t. 100. *With.* vol. iv. p. 118.

FUCUS flagellaris, *Esper, l. c.* t. 105.

HAB. On rocks and stones in the sea, near low water mark, and at a greater depth. Perennial. Summer and Autumn. Not uncommon on the British coasts. Jersey, *Miss White.*

GEOGR. DISTR. Atlantic Ocean, from the British shores to those of North Africa. North Sea, very rare. Mediterranean Sea.

DESCR. *Root*, a small disc, accompanied by fibres. *Fronds* one or several from the same base, from three to twenty inches in length, cylindrical, as thick as small twine, gradually tapering towards the apex to a long, subulate point, very irregularly branched. Some specimens divide near the base into a few, long, simple, naked branches, which are almost destitute of ramuli; others are more or less dichotomous, with many lateral, secund branches, and tolerably furnished with similar ramuli. Usually the branches are very

erect; but sometimes they are arched; and, in a distorted variety occasionally found, they are bent at right angles in a zigzag manner. In all the lesser branches and ramuli taper considerably to each end. *Tubercles* (*coccidia*) large, sessile, roundish or subovate, with a subacute nipple, plentifully scattered over the branches, and containing a mass of minute, ovate *spores*; their pericarp composed externally of radiating filaments, internally of angular cells. *Tetraspores* minute, imbedded in the surface cells of the branches, or distinct plants. *Colour* a pale or deep purple-red, becoming greenish, and at length white in decay. *Substance* cartilaginous, flexible, horny when dry, and very imperfectly adhering to paper.

A variable plant, as its numerous synonymes testify, and yet, with a little practice, easily recognized among British Algæ. Several exotic species, however, nearly approach it, some of which ought, perhaps, to be united with it.

By Dr. J. Agardh, in his excellent work on the Algæ of the Mediterranean, *Gracilaria confervoides* is placed in the genus *Hypnea*. If the differences between the genera *Hypnea* and *Gracilaria* consist, as Agardh declares, more in peculiarities of natural habit than of definite structural characters, in my opinion, *C. confervoides* coincides better with the latter group; and I am very unwilling to place it in a different genus from such nearly allied plants as *G. dura* and *G. compressa*. But besides natural habit, the tetraspores in the *true Hypneæ* are, I believe, always annularly divided, like those of *Plocamium*, and I am not aware of this being the case in any species of *Gracilaria*.

Fig. 1. GRACILARIA CONFERVOIDES:—*natural size*. 2. Longitudinal semi-section of a branch. 3. Transverse section of the same. 4. Vertical section of a tubercle. 5. Spores from the same.

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W. W. Del. et Lith.

Reeve, Benham & Reeve imp.

Plate CLXXVII.

GRACILARIA ERECTA, *Grev.*

Gen. Char. *Frond* filiform, or rarely flat, carnoso-cartilaginous, continuous, cellular; the central cells very large, empty or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface.

Gracilaria *erecta*; fronds numerous from a common disk, short, erect, cylindrical, sparingly dichotomous; branches subsimple; tubercles globose, clustered; tetraspores contained in terminal, lanceolate, pod-like ramuli.

Gracilaria erecta, *Grev. Alg. Brit.* p. 124. t. 14.

Plocaria erecta, *Endl. 3rd Suppl.* p. 51.

Gigartina erecta, *Hook. Br. Fl.* vol. ii. p. 300. *Wyatt, Alg. Danm.* no. 115. *Harv. Man.* p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 200.

Sphærococcus (?) erectus, *Grev. Crypt.* t. 357.

Hab. On sand-covered rocks near low-water mark; also in 4–5 fathom water. Perennial. Fruiting in winter. Very rare. Sidmouth and Torquay, *Mrs. Griffiths.* Belfast Bay, *Mr. W. Thompson.* Port Ballantrae, *Mr. D. Moore.* Roundstone, *Mr. Mc Calla.* Orkney, *Rev. J. H. Pollexfen, Lieut. Thomas, and Dr. Mc Bain.*

Geogr. Distr. Coast of France.

Descr. *Root* a flat, thin disk, spreading on the rock. *Fronds* numerous from the same base, from two to four inches high, seldom so much, cylindrical, filiform, erect, twice as thick as hog's bristle, irregularly branched; sometimes simple for their greater length, forked at the apex; sometimes twice or thrice forked; sometimes furnished with a few lateral branches. *Branches* mostly simple, long, naked, often flexuous, tapering to a fine point. *Tubercles* sphærical, very prominent, densely clustered on the branches, often near the tips, containing, under a thick, cellular coating, a large central mass of minute spores. *Tetraspores* contained in lanceolate, terminal *pods* or swollen ramuli, which are mostly in pairs; oblong, transversely parted. *Colour* a more or less deep red, becoming darker in drying. *Substance* cartilaginous, somewhat rigid. It does not adhere, or but very imperfectly, to paper in drying.

A curious and elegant little plant, scarcely known out of England, and one of the discoveries of Mrs. Griffiths, to whom it has long been familiar under the manuscript name *suffocatus*;

a name designed to express a peculiarity of growth, its favourite habitat being the flat bottoms of shallow rock-pools, where it is generally half buried in sand. Dr. Greville, who first described and figured it in his Cryptogamic Flora, gave it the name *erectus*, from another of its distinguishing characters, the peculiarly upright and rigid frond. When in perfect fructification it is easily recognised; the clustered tubercles and the lanceolate pod-like tips being both very striking characteristics. But barren specimens are exceedingly like, except in colour, young plants of *G. confervoides*, from which their greater simplicity, and more rigid substance, and erect growth, alone distinguish them. It is proper to mention that the Orkney specimens above noticed are without fruit; and, therefore, notwithstanding the perfect resemblance of their frond to Devonshire individuals, some doubt may rest upon their identity. In my own judgement they *do* belong to this species; but I am informed that another very competent authority is not satisfied; nor until fertile plants shall have been procured is it possible to determine which opinion is correct. The French specimen, communicated by M. Lenormand, is also barren, and is therefore equally doubtful.

Fig. 1. GRACILARIA ERECTA, with *pods*. 2. With *tubercles*:—*both of the natural size*. 3. Pods. 4. Transverse section of the surface of a pod, showing imbedded tetraspores. 5. A tetraspore. 6. Branches with tubercles. 7. Transverse section of a branch and a tubercle:—*all more or less magnified*.

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PLATE CXVI.

HYPNEA PURPURASCENS, *Harv.*

GEN. CHAR. *Frond* filiform, cartilaginous, continuous, much branched, cellular; with a dense, more or less evident fibro-cellular axis, surrounded by several rows of angular cells, the innermost of which are largest, the outer gradually smaller to the circumference. *Fructification* of two kinds on distinct individuals; 1, spherical *tubercles* (*coccidia*), sessile or immersed in the ramuli, containing a mass of small spores on a central placenta; 2, transversely parted *tetraspores* imbedded in the cells of the surface. HYPNEA (*Lamour.*),—an alteration of *Hypnum*, the name of a genus of Mosses, in allusion to the mossy character of some of the original species.

HYPNEA *purpurascens*; frond dull purplish-red, excessively and irregularly branched, bushy, cartilaginous, soft; branches alternate, elongate, densely clothed with slender, many times divided branchlets, whose ultimate divisions are setaceous; tubercles spherical, immersed in the ramuli.

GRACILARIA purpurascens, *Grev. Alg. Brit.* p. 122.

PLOCARIA purpurascens, *Endl. 3rd Suppl.* p. 51.

CYSTOCLONIUM purpurascens, *Kütz. Phyc. Gen.* p. 404. t. 58. f. 1.

GIGARTINA purpurascens, *Lamour. Ess.* p. 136. *Lyngb. Hyd. Dan.* p. 46. t. 12. *Grev. Fl. Edin.* p. 290. *Hook. Br. Fl.* vol. ii. p. 299. *Harv. in Mack. Fl. Hib.* part 3. p. 200. *Harv. Man.* p. 73. *Wyatt, Alg. Danm.* no. 74.

SPHÆROCOCCUS purpurascens, *Ag. Sp. Alg.* vol. i. p. 318. *Ag. Syst.* p. 236. *Spreng. Syst. Veg.* vol. iv. p. 339. *Hook. Fl. Scot.* part 2. p. 134. *Fl. Dan.* t. 1835.

FUCUS purpurascens, *Huds. Fl. Ang.* p. 589. *Sm. E. Bot.* t. 1243. *Turn. Syn.* p. 357. *Turn. Hist. Fuc.* t. 9.

FUCUS tuberculatus, *Lightf. Fl. Scot.* p. 226.

Var. β. *cirrhosa*; irregularly branched and variously distorted, the branches zig-zag, here and there swollen, the apices lengthened into tendrils, which coil round the stems of neighbouring plants.

FUCUS tuberculatus, β, *Lightf. Fl. Scot.* p. 927.

GIGARTINA purpurascens, β, cirrhosa, *Lyngb. Hyd. Dan.* p. 46.

HAB. On rocks and stones, within tide marks. Very common on all the British shores. Annual. Summer.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* fibrous. *Fronds* from six inches to two feet in length, cylindrical, as thick as a crow's quill at base, slightly widening towards the middle, and again tapering to the apex, very much branched and bushy. Main stem

either undivided, but furnished with numerous alternate lateral branches; or irregularly forked, and gradually dissipated in the bushy frond; branches long, simple or compound, much attenuated, more or less densely clothed with quadrifarious multifid branchlets, from one to two inches in length, alternately divided. *Ramuli* setaceous, acute, slightly tapering at the base. *Tubercles* abundant, forming a spherical swelling in the middle of the ramuli, one or more in each ramulus. *Tetraspores* oblong, divided by three transverse lines, into four parts, vertically immersed among the cells of the surface, dispersed through the smaller branches and ramuli. *Substance* cartilaginous, soft, imperfectly adhering to paper. *Colour* a dull purplish-pink, often pale; becoming much darker in drying.

The genera *Hypnea* and *Gracilaria* are, as I have already noticed in the remarks under Plate LXV., very closely allied to each other, but the character derived from the tetraspores, there pointed out, will not serve to distinguish them, for I have since ascertained that annular tetraspores exist in most of the *Gracilariæ*, as well as in *Hypnea*. If the two genera are to be maintained we must look for other distinctions, and these may be most readily found in the structure of the frond, the true *Gracilariæ* having an axis composed of very large cells; the *Hypneæ* having a more or less evident fibro-cellular axis, composed of minute, elongated cells. The calibre of this axis varies greatly in the different species, in some of which it exists like a thread; in others, as in the present species, it is of great size, and the cells by which it is surrounded are of much smaller dimensions than in the typical *H. musciformis*. Kützing, indeed, forms a new genus, which he calls *Cystoclonium* for our *H. purpurascens*. In this step I am not disposed to follow him, because it appears to me that the difference in structure is more one of degree, than of kind; and because the cirrhose habit of our var. β. indicates a close relationship with the *Hypneæ*, most of which produce similar tendrils.

Hypnea purpurascens is among the commonest of our Algæ, very variable in appearance, and very widely dispersed through the North Atlantic. If allowed to retain its place, it is the most northern example of the genus, none others being found north of the Mediterranean.

Fig. 1. HYPNEA PURPURASCENS:—*of the natural size*. 2. Portion of a ramulus. 3. Section of a tubercle. 4. Tetraspores. 5. Cross section of the frond 6. Longitudinal semi-section of the same:—*all magnified*.

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